



Technological University Dublin
ARROW@TU Dublin

Other Resources

School of Surveying and Construction
Management

2016-9

A Time for Change” An Evaluation of the Ability of the Quantity Surveyor to Measure Mechanical and Electrical Services Under the Irish Public Works Contracts (designed by the employer) using the Agreed Rules of Measurement.

Charles Mitchell

Technological University Dublin, charles.mitchell@tudublin.ie

Follow this and additional works at: <https://arrow.tudublin.ie/beschreoth>

 Part of the [Other Engineering Commons](#)

Recommended Citation

Mitchell, C. (2016). "A Time for Change” An Evaluation of the Ability of the Quantity Surveyor to Measure Mechanical and Electrical Services Under the Irish Public Works Contracts (designed by the employer) using the Agreed Rules of Measurement. doi:10.21427/wdch-fs97

This Theses, Masters is brought to you for free and open access by the School of Surveying and Construction Management at ARROW@TU Dublin. It has been accepted for inclusion in Other Resources by an authorized administrator of ARROW@TU Dublin. For more information, please contact yvonne.desmond@tudublin.ie, arrow.admin@tudublin.ie, brian.widdis@tudublin.ie.



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 3.0 License](#)



SCHOOL OF THE BUILT ENVIRONMENT

MSc in Quantity Surveying (M&E)

“A Time for Change”

An evaluation of the ability of the Quantity Surveyor to measure Mechanical and Electrical services under the Irish Public Works Contracts (designed by the employer) using the Agreed Rules of Measurement.

Abstract

This dissertation seeks to examine the ability of the quantity surveyor to measure mechanical and electrical bills of quantities under the Irish Public Works Contracts using the Agreed Rules of Measurement 4. The study uses the opinions and perspectives of a broad range of industry stakeholders to identify barriers and drivers which will facilitate this change.

A mixed methodology research method incorporating both quantitative and qualitative research methods was used. A literature review covers relevant research in the field of the Public Works Contracts, the use of bills of quantities and specialist sub-contractors. The results of an unreported survey carried out by the CIF gives insight into current tendering practices in the mechanical and electrical services sector, whilst semi structured interviews with industry stakeholders provides a balanced overview.

The research highlights the benefit of the amendments will broadly produce while focusing on the benefits to the mechanical and electrical sector. The main barrier however is the lack of technical knowledge of the quantity surveyor which all parties believe to be a major issue.

Based on the research the author makes a number of recommendations relating to the review of the ARM4 (including Supplement 2), the need for the academic institutions to work with industry in relation to further education and the encouragement of collaboration between design team members. Further research is suggested in relation to the development of BIM protocols and collaborative tools.

Keywords: Mechanical and Electrical, Measurement, Bills of Quantities, Public Works Contracts.

Acknowledgements

Firstly, I wish to thank the staff of Salford University for the help over the durations of the programme.

I would also like to express my appreciation and thanks to my wife, Aoife, for being so patient and understanding both during the course of my studies and also during the period of this dissertation.

List of Abbreviations

APC	Assessment of Professional Competency
ARM4	Agreed Rules of Measurement 4
BIM	Building Information Modeling
CIF	Construction Industry Federation
FIDIC	Fédération Internationale Des Ingénieurs-Conseils
GCCC	Government Construction Contracts Committee
GDLA	Government Departments and Local Authorities
IEI	Institute of Engineers Ireland
NEC	New Engineering Contracts
NPPPU	National Public Procurement Policy Unit
NQF	National Framework of Qualifications
OGP	Office of Government Procurement
PWC	Public Works Contracts
RIAI	Royal Institute of Architects of Ireland
RIBA	Royal Institute of British Architects
SCSI	Society of Chartered Surveyors Ireland
SRC	Strategic Review Committee

Contents

Abstract.....	ii
Acknowledgements.....	iii
List of Abbreviations	iv
Table of Figures.....	vii
List of Tables	viii
1. Chapter One – Introduction.....	1
1.1 Background.....	2
1.2 Scope of Research.....	3
1.3 Aims and Objectives	3
1.3.1 Aim	3
1.3.2 Objectives	4
2. Chapter 2 – Literature Review	5
2.1 Introduction and background to the literature review.....	6
2.2 An overview of Public Works Contracts in Ireland.....	7
2.3 The use of Bills of Quantities in Irish Public Works Contracts	12
2.4 Specialist sub-contractors in Public Works Contracts	14
2.4.1 The need for early engagement with specialists.	19
2.5 Using Mechanical and Electrical cost data-bases in the future.....	19
3. Chapter 3 – Research Methodology.....	21
3.1 Introduction.....	22
3.2 Research Aim.....	22
3.3 Research Strategy.....	22
3.3.1 Research Hypothesis.....	23
3.3.2 Quantitative Research	24
3.3.3 Qualitative Research	24
3.3.4 Mixed Methods Research.....	25
3.4 Research Method Adopted.....	25
3.4.1 Secondary Data Research.....	25
3.4.1.1 Desk Study – Literature Review	26
3.4.2 Primary Research	26
3.4.2.1 Interview	26
3.4.3 Data Collection and Analysis.....	27
3.4.4 Ethical Considerations	27
3.4.5 Limitations to methodology	28

3.4.6 Conclusions.....	28
4. Chapter 4 – Research Analysis and Findings.....	29
4.1 Introduction.....	30
4.2 Interviews.....	30
4.3 CIF Poll.....	37
4.4 Quantity Surveying Courses in the Republic of Ireland	40
4.4.1 Undergraduate quantity surveying programmes	40
4.4.2 Postgraduate quantity surveying programs	41
4.5 Conclusions.....	42
5. Chapter 5 – Conclusions and Recommendations.....	43
5.1 Introduction.....	44
5.2 Dissertation Aim	44
5.3 Dissertation Objectives and Findings	44
5.4 Recommendations.....	47
5.5 Limitations of the Research	48
5.6 Further Research	48
Conclusions.....	48
References.....	50
Appendix A: CIF Survey	54
Appendix B: Interview Transcripts.....	56
Appendix C: Ethical Approval.....	93

Table of Figures.

Figure 1: Graph showing M&E costs as a percentage of the total construction cost (McCaffrey, 2010)	6
Figure 2: Effect of Interim Measure 1 on the Conditions and Schedules (Construction Procurement Policy Unit of the Office of Government Procurement, 2015)	14
Figure 3: Schedule for PW-CF1 to PW-CF5 (long forms) Part 1 of the schedule (extract) (Source: OGP,2016)	15
Figure 4: Schedule for PW-CF1 to PW-CF5 (long forms) Part 2 of the Schedule (extract) (Source: OGP, 2016)	15
Figure 5: Mechanical and Electrical services Costs as a percentage of Total Construction Costs, Malaysia (Yusaf et al 2012).	18
Figure 6: Research objectives (Broad Group) (Source: Author, 2016)	23

List of Tables

Table 1: Benefits of Design & Build and Fixed Price Contracts (Source: Author 2016)	9
Table 2: Form of Contract for Public Works in Ireland (Source: Author, 2016).....	11
Table 3: Summary of average construction costs (Ireland) 2008, 2012 and 2016 (Bruce Shaw)	(Source Author 2016) 17
Table 4 - Interview Participants (Source: Author, 2016)	30
Table 5 - Survey response rate (Source CIF, 2016, not reported).....	37
Table 6 – Question 1 Responses (Source, Author 2016)	37
Table 7 - Question 2 responses (Source, Author 2016)	39
Table 8 Undergraduate programs in the Republic of Ireland (Source, Author 2016).....	40
Table 9 – Under graduate Quantity Surveying Course Summary (Source, Author 2016).....	41
Table 10 - Post graduate programs in the Republic of Ireland (Source, Author 2016).....	41
Table 11 - Postgraduate quantity surveying course summary (source, Author 2016)	42

1. Chapter One – Introduction

1.1 Background

Prior to 2006 the majority of publically funded construction projects, where 50% or more of the project was funded by government funding, were carried out under the Government Departments and Local Authorities (GDLA) form of contract. This form of contract is based on the Royal Institute of Architects of Ireland (RIAI) form of contract and is described as being similar in most aspects (Keane, 1997). Whilst this form of contract was published by the RIAI in agreement with the Construction Industry Federation (CIF) and the Institute of Engineers Ireland (IEI) it was only adopted for use of projects funded by the exchequer once ratified by the Department of Finance in 1982.

The RIAI forms of contract were for building works and there were two forms for work over IR£500,000.00. The first form was the yellow form and this stipulated that quantities must form part of the contract. This meant that the project was tendered using a client prepared bill of quantities and would be subject to re-measurement. The second was the blue form where quantities did not form part of the contract. This in essence was a fixed price contract based on drawings and specification. The GDLA, however, was predominantly used with a fully measured bill of quantities as defined at that point in time.

However, a new suite of Public Works Contracts (PWC) were launched by the Government Construction Contracts Committee (GCCC) in 2006. These contracts were designed for use on all publicly funded projects in the Republic of Ireland (Government Contracts Committee for Construction, 2014). This new suite of contracts contains ten contracts for use in construction and civil engineering projects in Ireland. The two most widely used forms are:

- The traditional Employer designed form, and
- Design and Build Forms (Contractor designed)

The introduction of this suite of contracts heralded some major changes for those involved in projects governed by the PWC. The main changes were that the bill of quantities, in its traditional form, had been replaced by a pricing schedule and a works requirement document. The latter document was deemed to take precedence in relation to procurement and disputes. The contractor was now responsible for pricing 100 per cent of the works even when works were defined as needing to be carried out by specialist contractors. The practice of the inclusion of prime cost and provisional sums was excluded from the PWC.

The interim review of the PWC as carried out by the GCCC noted that this new suite of contracts did not bring with it, at its introduction, the cost certainty which was expected due to the economic downturn. The result of this interim review was that the GCCC offered recommendations to the government in order to correct some provisions of the existing suite. On foot of this documents the government issued its document outlining a programme for the implementation of these interim measures (Construction Procurement Policy Unit of the Office of Government Procurement, 2015).

One key amendment introduced, and noted below, and forms the source of this research.

- A. The level of risk imposed by the contract is to be reduced by reinstating the bill of quantities as the primary reference document for tender purposes on project designed by the employer.

The Office of Government Procurement (OGP) document goes further so as to note that this amendment in relation to building contracts in that all elements of the works shall be measured in accordance with a standard method of measurement and cites the Agreed Rules of Measurement 4th Edition (ARM4) as the standard method.

This note goes further in as such that it requires all mechanical and electrical installations within the works to be fully measured in accordance with the standard method of measurement. The OGP acknowledges that this is a departure from the industry standard of large items and lump sums and instructs that all such installations be measured in accordance with the ARM Supplement 2 for a period of 18 months from the date of the introduction of the amendments. This is an abridged method of measurement for services.

1.2 Scope of Research

The scope of this research is to investigate how prepared industry is to incorporate the amendments into the procurement of mechanical and electrical services within Public Works projects. The issue is twofold in that the quantity surveyor is now charged with needing the skillset to understand and interrogate very specialist designs and technology in order to prepare tender documents which will form part of a construction contract. Building measurement is a key function of the quantity surveying profession but generally the more technological services elements were left to the remit of specialist consultant engineers who would procure and control these specialist mechanical and electrical packages. The second issue is that the specialist mechanical and electrical contractors have never been required to price traditional elemental bills of quantities for Public Works projects. This would lead the author to question how aware the specialist contractors are with regard to the implementation of the amendments and their familiarity with the ARM4.

1.3 Aims and Objectives

1.3.1 Aim

The Author seeks to investigate whether the Irish construction industry is ready to comply with the amended requirement of the Public Works Contracts to fully measure mechanical and electrical installations at tender stage in line with the Agreed Rules of Measurement 4th Edition (ARM4).

1.3.2 Objectives

The objectives of this research are defined out below:

- Critically evaluate current mechanisms for the quantification and tendering of mechanical and electrical services in both public and private contracts.
- Discuss the reasoning behind the amendment and the mechanism for its implementation
- Evaluate the ability of professional quantity surveyors to prepare bills of quantities for mechanical and electrical services.
- Discuss and analyse international best practice in relation to the measurement of mechanical and electrical services at tender stage.
- Access the current provision of training available in the Republic of Ireland for quantity surveyors involved in the quantification and costing of mechanical and electrical services.

2. Chapter 2 – Literature Review

2.1 Introduction and background to the literature review.

Publicly funded projects are those projects funded by the exchequer of a State. In the case of this research the questions posed relate to the current suite of Public Works Contracts (PWC) and the four proposed interim amendments which are currently being implemented as defined by the Office of Government Procurement (OGP). This research will focus primarily on the first interim measure which sees the bill of quantities returned to its original position as the primary pricing document but now incorporating the measurement of specialist works, particularly mechanical and electrical services. Secondly, this research will focus on the second interim measure which relates to the direct tendering of specialist works contractors with special consideration given to complex mechanical and electrical works packages.

This chapter will outline the development of the public works contracts in Ireland since the introduction of the Government Department and Local Authority (1982) form of contract through to the implementation of the interim measures noted above. The author also looks at the relevance of the use of bills of quantities in the pre and post contract stages of a construction project as well as the current mechanisms for the quantification and tendering of mechanical and electrical works packages in building works.

McCaffrey (2010) questions the need for the mechanical and electrical quantity surveyor and answers it with a simple slide.

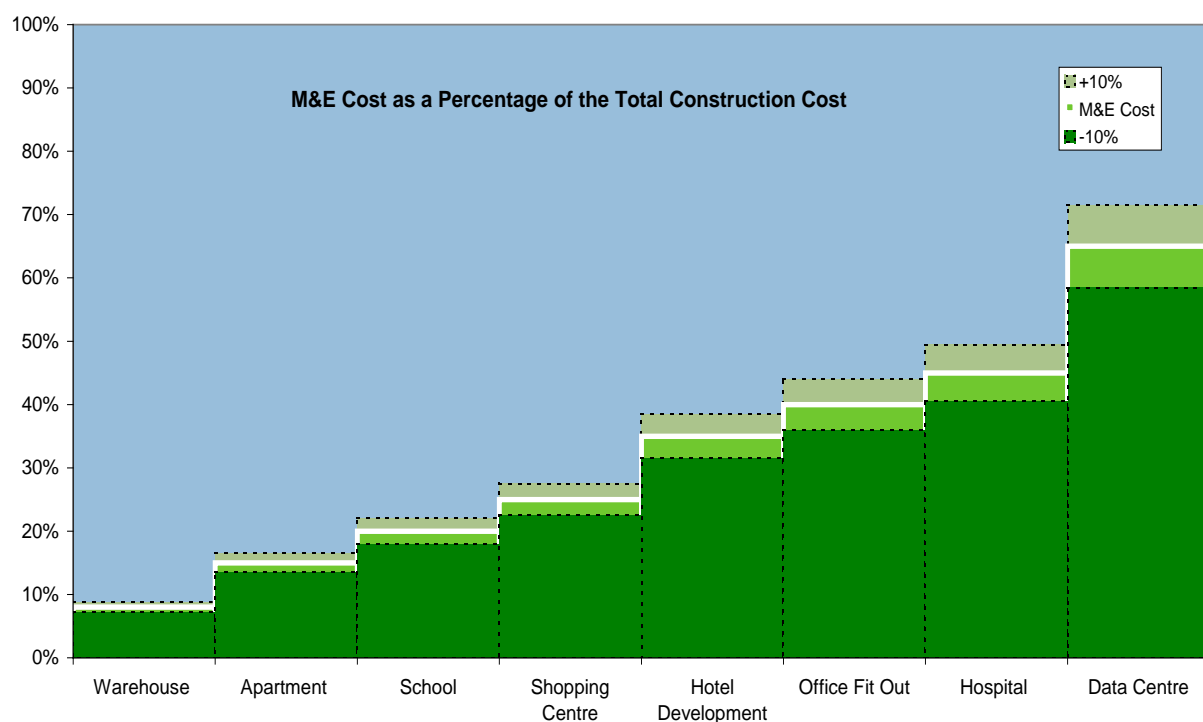


Figure 1: Graph showing M&E costs as a percentage of the total construction cost (McCaffrey, 2010)

Figure 1 shows that the percentage of cost attributable to mechanical and electrical services rises with the complexity of the structure in a similar way as described by Murry (1998) and by Pasquire (1994).

McCaffrey describes the traditional approach to quantity surveying on building projects as being where the quantity surveyor deals with the cost of the building works and the consultant services engineers deal with the mechanical and electrical element of the project. He goes as far as to say that the traditional approach fails as the services engineers are generally not able to manage costs as well as the quantity surveying profession. The proposed Interim Measure 1 of the PWC is founded on the belief that the quantity surveyor is best placed to manage all building costs including those relating to services. Murray and Yusaf et al. (2012) agree that quantity surveyors are not always fully aware of the technology of services and so the measurement of the services may be difficult. Swaffield et al. (2000) state that “*a sufficiently accurate cost estimate depended on an accurate understanding of the quality of M&E services required by the client*”. The issue of technical knowledge constantly raises its head as a serious issue in the course of the literature.

Gura (1984) made reference to the services consultant being required to produce bills of quantities directly in cases where the quantity surveyor were not charged with this responsibility. Where a quantity surveyor has been charged with this task, the services consultant may be required to provide additional information to enable the preparation of the bill of quantities. Again, the impression is given that the quantity surveyor may not have the full technical knowledge necessary to integrate the design in order to prepare a complete and satisfactory bill of quantities. But Murray and Yusaf et al. have both commented on the protective nature of the services engineer with regard to retaining control of the services element of the project. Dada & Jagboro (2012) emphasise the quantity surveying profession's constant exposure to “challenges and opportunities” and saw the need to measure building services in Nigeria as one of these challenges similar to that currently present in the Republic of Ireland. Pasquire also refers to the fact that designs may not always be complete and that the ideal world scenario does not always exist.

Given that the title of the quantity surveyor is now a protected title by law in Ireland under the Building Control Act 2007 (Irish Statute Book, 2007) and that interim measure 1 notes a “competent cost consultant (such as a quantity surveyor)” as being the only person permitted to produce a bill of quantities in line with the prescribed standard method of measurement, the Agreed Rules of Measurement 4th Edition (ARM4) in building contracts, there appears to be no role for the services consultant in the production of mechanical electrical bills of quantities, unless carrying a dual qualification.

2.2 An overview of Public Works Contracts in Ireland

This element of the research looks at the current suite of Public Works Contracts used within the Irish construction industry. The fore runners to the current suite of contracts were the GDLA

1982 and the Institute of Engineers Contract (first developed in 1980) 3rd Edition (IEI) (1990 & 1993) for civil engineering works. These contracts remained in “*use by contracting bodies within the State before the introduction of the new conditions of engagement on 1 January 2007 and the new construction contracts on 19 February 2007*” (Dept. of Finance, 2011).

The Department of Finance notes that the GDLA form of contract was used in building contracts and was closely modelled on the RIAI and the Royal Institute of British Architects (RIBA) private sector forms of contract which were in use at the time. This is confirmed by Keane in his commentary on the RIAI contract.

Both of these contracts were in use for over 25 years in public construction but did not offer a contractual solution in every instance. As a result some contracting authorities entered into bespoke and amended contracts for various projects. The Department of Finance notes that this led to a duplication of effort and had a negative impact on the exchequer due to cost overruns. One damning comment by the Department of Finance was that “*the contracts themselves tended to incentivise contractors to bid initially low in order to win a contract and later to successfully exploit price variation and risks residing with the contracting authority in order to maximise the final contract cost*” (Dept. of Finance, 2011). Even contractors representatives noted the “*public outcry generated by a particularly high publicised series of cost overruns on infrastructure projects*” (Fogarty, 2009).

Ramus, Griffith and Birchall (2006, p.51) note that “*using an inappropriate standard form of contract for a project is dangerous. It will often mean that objectives in terms of time, cost and quality are not fully realized and that the likelihood of disputes will increase*”. This is all too apparent in the Department of Finance’s commentary and leads to the question of a review of practice rather than the contracts themselves. While Latham (1994) explains that clients have a say in the choice of contract Cunningham (2013) notes that where there is a “*limited choice of “indigenous” standard forms that it is easy to develop a mind set to recommend a familiar form*”. In Irish situation pre-2007 this choice was indeed limited.

However, 2007 saw the introduction of the new suite of Public Works Contracts, as noted in Table 1 below, which were drafted by the Government Construction Contracts Committee (GCCC) in response to the finding of the 2004 *Implementation and Administration of EU Structural and Cohesion Funds in Ireland* Report. This report noted the evidence of significant differences between original tenders and final accounts which occurred in traditional re-measurement contracts. The report outlines the reason for such differences as follow:

“a) The ‘risk allocation’ is such that large elements of ‘risk’ are assigned to the contracting authority on the principle that over a large number of projects they are better off paying for what actually happens on each individual job rather than having tenderers price for all eventualities on all jobs with the contracting authority paying whether or not the eventualities arise

b) Changes to design during the course of the works

c) *Additional elements of work*

d) *Price fluctuation*".

(Department of Finance, 2004)

As a result of this report the Comptroller and Auditor General (C&AG) examined a range of alternative contractual arrangements with a particular focus on design and build and fixed price contracts. One of the key points of this examination was the evaluation of risk within the contract and the establishment of which party was best able to handle and mitigate this risk. Clamp, et al. (2007) seem to agree with this approach and discuss the need to establish profiles for determining extent of design responsibilities and where they rest, as well as the most suitable procurement methods and contract practises.

The report cited the following benefits in relations to design and build contracts and fixed price contracts.

Design and Build Contracts	Fixed Price Contracts
<ul style="list-style-type: none">• Improve efficiency because the contractor can influence buildability	<ul style="list-style-type: none">• Allow a greater level of risk transfer to take place (including the risk of construction inflation)
<ul style="list-style-type: none">• Provide greater certainty of outturn by passing more risk to the contractor in cases where he is better positioned to manage it; and• Eliminate the opportunity for a contractor to use a strategic pricing strategy	

Table 1: Benefits of Design & Build and Fixed Price Contracts (Source: Author 2016)

However, the issue of cost overruns was not just an Irish issue and had been highlighted in the UK for many years prior to this. Both the Latham and Egan Reports (1994 and 1998 respectively) on the construction industry brought about major reforms in the construction industry which included changes in legislation and conditions of contract. This had led, in 1997, to the establishment in Ireland of the Strategic Review Committee (SRC) by the Minister for the Environment and Local Government. The SRC was charged with the formulation and development of a strategy for the construction industry. One of the recommendations of the SRC was the need for new standard forms of contract to be developed in a plain language which reflected modern drafting techniques.

“A new set of standard forms of contract should be produced for main contracts and both nominated and domestic sub-contracts. There should be standard wordings for collateral agreements, performance bonds, retention bonds and insurances. These new documents, should not, in general, be modified for particular projects. Where special circumstances make modifications necessary, these should be set out in clearly identified addenda”

(Government of Ireland, 1997)

Following on from this the government introduced the Construction Procurement Reform Initiative in May 2004. Three high level objectives were defined:

- Greater cost certainty at tender stage,
- Better value for money outcomes, and
- Contributing to timelier and more effective delivery of projects.

The mechanism chosen to achieve these high level objectives was the introduction of new standard forms of contracts which were better suited to the transfer of risk to those best able to manage it. The contracts were to be lump sum fixed price contracts with competitive tendering as being normal. The same principals were to be applied to the standard conditions for the procurment of construction consulatncy services such as architects, engineers, quantity surveyors etc.

The next step taken was the formualtion of the National Public Procurement Policy Unit (NPPPU) in order to set about drafting this suite of contracts. Once the initial draft was complete the GCCC was formed comprising of construction experts from different disciplines across various Governement departments and agencies who have a public sector perspective. The GCCC examined and commented on the drafts of the various contracts during the consultation period. Following on from this the key stakeholders such as the Construction Industry Federation and other professional bodies were consulted in relation to the proposed new contractual arrangement and the details of their implementation. Fogarty (2009) comments on the extended period of discussions between the stakeholders and the GCCC over a 15 month period which saw some of the more *“objectionable provisions”* being removed from the draft PWC. He further noted that the *“core principal of substantial and inappropriate risk transfer to contractors remained intact”*. Cunningham (2012) agrees that the new suite of PWC *“lacks balance in its risk allocation approach”* but does see it containing measures which support the aims of the Department of Finance. Cunningham does go further to discuss the need for risk only to be transferred where *“sufficient information allows it to be accurately priced”* and the concludes on the allocation of risk in the original PWC by stating that a return to the previous arrangement which saw the employer bearing the risk as being *“the more prudent approach”*.

However, the new suite of PWC were issued for use in 2007 as the Irish construction industry entered into a period of economic decline and research by the Society of Chartered Surveyors

Ireland (SCSI)(2012) shows a 30% drop in construction tender prices.

Contract Reference	Contract Titles
	Building
PW-CF1	Public Works Contract for Building Works Designed by the Employer
PW-CF2	Public Works Contract for Building Works Designed by the Contractor
	Civil Engineering
PW-CF3	Public Works Contract for Civil Engineering Works Designed by the Contractor
PW-CF4	Public Works Contract for Civil Engineering Works Designed by the Employer
	Minor Work, Building and Civil Engineering
PW-CF5	Contract for Minor Building & Civil Engineering Works designed by the Employer
PW-CF6	Public Works Short Form of Contract
	Investigation Work, Building and Civil Engineering above and below ground
PW-CF7	Public Works Investigation Contract
PW-CF8	Public Works Short Form of Investigation Contract
	Framework Agreement
PW-CF9	Public Works Framework Agreement
	Early Collaboration Contract
PW-CF10	Public Works Contract for Early Collaboration
	Term Maintenance and Refurbishment Contract
PW-CF11	Term Maintenance and Refurbishment Contract

Table 2: Form of Contract for Public Works in Ireland (Source: Author, 2016)

In 2013, a review of the performance of the PWC took place which highlighted that contractors had chosen not to price the transferred risk into tenders for a variety of reason. They chose instead, once awarded the contract, to make claims under various headings. The report recognises the changed Egan market and the need to encourage more realistic pricing much in the way the Latham and Egan had noted. As a result of this review a number of key measures were proposed following on from engagement with a wide range of industry representative groups. These include:

1. Reducing the level of risk currently being transferred by making the bill of quantities the primary reference document for tender purposes on employer-designed contracts;
2. Direct tendering of specialist works packages where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project;
3. In awarding works projects, a greater concentration on quality criteria that are directly

- linked to the project in order to deter unsustainable pricing, and;
4. The inclusion of informal dispute resolution methods to reduce the volume of disputes that have currently been referred to the formal procedures prescribed in the contract.

Measure 1 is key to this research as the first measure confirms the reinstatement of the bill of quantities as the primary pricing document in contracts designed by the employer, whilst the report issued by the OGP (2015) defines the requirement to fully measure mechanical and electrical packages in accordance with the relevant work sections of the ARM4.

This report further acknowledges that the profession of quantity surveyor is best suited to the production of complete bills of quantities. It does cite the use of the Supplement 2, a simplified method of measurement for mechanical and electrical works, as being permitted for a period of 18 months from the introduction of the interim measures so as to allow the “acquisition of such capabilities”.

At this point two further items need to be addressed:

1. The title of quantity surveyor is now protected by law under the Building Control Act 2007 and only those who meet the requirements for inclusion on the register may use the title. Anyone offering services under this title may be penalised with a fine of up to €5,000 and / or a 3 month jail sentence. This is relevant, as under the proposed interim amendments, the preparation of bills of quantities is to be carried out by “*a competent cost control expert, (such as a Quantity Surveyor)*”. The interim measures go further so as to specify that bills of quantities “*shall not be produced by specialist consultants without the input of a competent cost control expert*”. Such measures confirm the stature of the profession within the PWC, however the measures acknowledge the need for the quantity surveyor to upskill.
2. The introduction of a defined period to “permit the acquisition of such capabilities” with regard to the upskilling of quantity surveyors in the technology and techniques associated with mechanical and electrical measurement acknowledges the fact that the profession is deemed to be deficient in this field. Yusaf et al. (2012) make similar observations regarding the barriers to the introduction of standard methods of measurement for mechanical and electrical services in Malaysia. This report also emphasises the “*need to address the knowledge gap among professionals and ensure early involvement of specialist contractors*”.

2.3 The use of Bills of Quantities in Irish Public Works Contracts

Hore et al (2009, p. 4) describe bill of quantities as consisting of “*a schedule of items of work to be carried out under the contract with quantities entered against each item*”. Other commentators such as Brook (2008, p.50) describes the traditional purpose of bills of quantities as acting “*as a uniform basis for inviting competitive tenders, and to assist in valuing completed*

works". Whilst Ashworth (2004) goes further by, agreeing to the above statements and, adding that the bill of quantities serves as a contractual document allowing a parity in tendering and the basis for the production of interim certificates and valuing if variations. The Liaison Committee Code of Practice for Tendering and Contractual Matters (The Liaison Committee, 2006) recommends that bill of quantities be provided as tender documents where quantities form part of the contract. However, commentators such as Rashid et al. (2006) acknowledge the use of bills of quantities in Commonwealth countries as part of a traditional procurement system whilst noting evidence of a decline in their use in the UK since the mid 1980s. However, Rashid et al. conclude that the bill of quantities "*is still viable as an important cost document*" which forms part of the contract documentation.

In the past the GDLA yellow form of contract where quantities form part of the contract, in a similar fashion to the RIAI yellow form, issues clear guidelines on the inclusion of bills of quantities as a contract document. Clause 3 (a) (i) of the GDLA states that that bills of quantities "*shall be deemed to provide for the quality and quantity of the work set out in the descriptions and quantities in the Bill*". While both contracts have two distinct versions, depending on whether or not quantities form part of the contract documents, the onus on the importance of bills of quantities is not lost. Keane (1997 p.71) notes that that "*bills of quantities not forming part of the contract is unusual now and if a bill of quantities is prepared it is almost always made a contract document*".

With the introduction of the new suite of PWC in 2007, the bill of quantities was relegated to the position of schedule of rates referred to as the "*pricing document*". This matter is further defined within the Capital Works Management Framework Guidance Note: Public Works Contracts GN1.5 (Department of Public Expenditure and Reform, 2013). The primary document was the Works Requirements document which defined the specification and extent of the works, including quantities in certain situations. In essence the PWC introduced fixed price contracts where the works were designed by the employer. In its report on the Review of the Public Works Contracts (GCCC, 2014) the GCCC reiterated on the 2004 expectations of the then Government that, "*it was expected, upon their introduction in 2007, that an average price increase of up to 10% would arise as contractors priced the risks transferred under the contracts*". The truth of the matter is that the collapse in the economy saw a fall in tender prices of as much as 30% (SCSI, 2012).

Whilst concerns have been raised as to the "*sufficiency and adequacy*" of bills of quantities in the construction industry currently (Bandi and Abdullah, 2012) and the need for the global "*industry to embrace alternative methods of measuring quantities in building projects* (Davis et al., 2009), the Irish Government has decided to reinstate bills of quantities as the "*reference document for the purposes of pricing the contract in the tender stage*" (Office of Government Procurement, 2015). Bills of quantities will now, in line with interim measure 1, take precedence over the Works Requirements in all PWC where the works are designed by the employer. This is similar to both the New Engineering Contracts 3rd Edition (NEC3) and FIDIC as outlined by (NEC, 2014).

PW-CF	Doc Title	Clause	Interim measure	Comment
1, 3 & 5	Conditions	1.3.1	1	<i>Pricing Document currently lower in hierarchy of Contract Documents than the Works Requirements. to be amended to state 'Fifth, the Works Requirements and the Pricing Document'</i>
1, 3 & 5	Conditions	1.3.4	1	<i>Revised wording required to define how inconsistencies will be resolved for the purposes of project completion</i>
1, 2, 3, 4 & 5	Conditions	11.1.1 (3)	1	<i>The detailed breakdown shall be based upon the BoQ</i>
1, 3 & 5	Schedule	Part 1 B	1	<i>The pricing document will be a BoQ to an agreed method of measurement</i>
1, 3 & 5	Schedule	Part 1 K17	1	<i>Redraft of K17 required where risk of quantities is held by the Employer - compensation event only in fixed text.</i>
6	Conditions	1.4	1	<i>Clause to be reworded</i>

Figure 2: Effect of Interim Measure 1 on the Conditions and Schedules (Construction Procurement Policy Unit of the Office of Government Procurement, 2015)

The OGP have specified, within their Implantation of the Interim Measures report, as to how discrepancies between the bill of quantities and the Works Requirement documents are to be resolved. This includes guidance as to which clauses under the contract such items should be addressed.

2.4 Specialist sub-contractors in Public Works Contracts

The ARM4 (2009) defines the use of Prime Cost Sums (PC Sum) as “*a sum provided for work or services to be executed by a nominated sub-contractor or for materials or goods to be obtained by a nominated supplier*”. The GDLA form of contracts allowed for the provision of such PC Sums in clause 16 and 17. The RIAI forms, on which the GDLA was modelled, has nearly identical clauses. This lead Keane (1997 p.136) to comment that the primary trades with the assistance of general labour looked after the majority of the works as required. However, due to the very increasing complexity of construction within these buildings it was necessary for the general contractor to go to “*specialist contractors who would deal with these parts of the works*”. These specialist contractors are involved in complex areas such as mechanical, electrical installations, lift installations, air conditioning and piling, etc. Each of these areas have a considerable design input. Thomas (2001) notes that nominated contractors “*appeared in the RIBA (Royal Institute of British Architects) Model Form of Contract at the beginning of the last century*”. Whilst agreeing to the usefulness of such a provision, he is slightly critical of how the provisions have become “*unnecessarily complicated*”. Keane comments that the practice arose from the architect’s desire to control the works.

Due to the detailed nature of more complicated services installations and the fact that a detailed design is generally “not sufficiently complete for billing at tender stage” (Murray, 1997) the

quantity surveying profession did not embrace the role of measurer for such system. Also Murray comments that some services engineers are “hostile” and protective in essence of their work. Another issue raised was the lack of sufficient skillset of the quantity surveyor in understanding the technology of specialist services, a concern also noted by Yusaf and Mohamad (2012) and by the OGP (2015).

When the current PWC were introduced in 2007, many industry stakeholders and their representative organisations called for the government to remove these forms of contract due to the unfair transfer of risk. Some commentators even looked to have these contracts replaced by other international forms such as the Fédération Internationale Des Ingénieurs-Conseils (FIDIC).

With regard to specialist subcontractors the PWC referred to these as named specialists and deals with them in two distinct manners. In the first instance the PWC, in Part 1 of the Schedule, specified that “*the main contractor will be required to enter into contract with these specialists at main contract award stage*”, (Office of Government Procurement, 2016).

F(iii) Named Specialists	<ul style="list-style-type: none"> ▪ Details of all Category of Specialist whom the Main Contractor will be required to enter contract with at Main Contract Award Stage.
--------------------------	--

Figure 3: Schedule for PW-CF1 to PW-CF5 (long forms) Part 1 of the schedule (extract)
(Source: OGP, 2016)

Secondly, in Part 2 of the Schedule the main contractor must name subcontractors who carry out specialist works as specified in the Works Requirements but whose appointment is at the discretion of the main contractor. In both cases it is obvious that the contractual arrangement imposed transfers all risk associated with the specialists to the main contractor.

E Specialists named by the Contractor, (PW-CF2 and PW-CF4 only)	The name of one Specialist reference to be entered by the Contractor for each of the elements Items identified by the Employer.
---	---

Figure 4: Schedule for PW-CF1 to PW-CF5 (long forms) Part 2 of the Schedule (extract)
(Source: OGP, 2016)

Cunningham (2016) refers to the “removal of the provisions of nominating subcontractors” by the omission of the practice of including PC Sums as possibly having negative implications for the achievement of quality in these specialist works. Keane (1997) had eluded to the fact that the process of nomination under the RIAI and GDLA forms of contract was an attempt to impose quality standards for works outside of the main contractors normal scope of works. However, Cunningham does go further so as to say that the previous practices associated with the nomination of specialist sub-contractors removed cost control of these elements of the project from the contractor and frequently led to cost overruns. Murray (1997) also noted that

the complexity of modern building services required input from specialist design engineers who did not wish to transfer responsibility to the cost controller, in this case the employer's quantity surveyor.

Whilst it appears that Part 1 of the Schedule (f(ii)) allows the employer to name a specialist contractor, the contractual arrangement is directly between the main contractor and the specialist as a sub-contractor. Cunningham notes that main contractor is free to "*exert considerable pressure*" on these specialists in order to be competitive at tender stage, sometime at the risk of quality. This is a clear departure from the mechanism for interaction with nominated contractors as previously administered under the GDLA form of contract. A clear reason for such a departure is evident in the section 2.5 of the Public Works Construction Contracts Training Manual which states its prime objective to "*Move towards greater cost certainty at contract award stage and ensure as far as practicable that the accepted tender prices and final cost are the same*" (2007, p.18). Cunningham goes further by stating that the criticisms of the current suite of PWC as being "*overly bureaucratic and expensive to administer, has done nothing to protect, reform or improve the Industry at a time of unprecedented difficulties are certainly strong and valid*". Fogarty (2009) concludes that the Irish Government, by the introduction of the PWC, has not achieved its aim of "*greater cost certainty*" or "*better value for money*". This a view which the Government appears to echo in its review of the PWC by the GCCC in 2014.

	2008	2012	2016	% M&E
Education	Per m2	Per m2	Per m2	Per m2
Primary Level (Dept. of Ed)	€1,230	€930	€1,210	10-15%
Secondary Level (Dept. of Ed)	€1,230	€930	€1,210	15-20%
Third Level	€1,800-2,800	€1,300 – 2,100	€1,520 – 2,470	20-25%
Healthcare				
Acute Hospitals (average cost)	€2,900 – 3,500	€2,200 – 2,500	€2,650 – 3,050	20-30%
- Ward Block	€2,500 – 3,000	€1,850 – 2,200	€2,200 – 2,650	20-25%
- Gen. Operating Theatres	€4,600 – 8,300	€3,300 – 6,200	€3,900 – 7,400	45-60%
- Nursing Homes	€2,200 – 3,300	€1,600 – 2,350	€1,900 – 2,800	20-25%
- Accident & Emergency	€3,200 – 4,700	€2,300 – 3,300	€2,750 – 3,900	25-30%
Municipal				
Fire station	€2,350 – 2,900	€1,750 – 2,100	€2,070 – 2,500	15-25%
Prison	€2,200 – 3,600	€1,600 – 2,300	€1,900 – 2,750	20-30%
Courthouse	€3,150 – 4,100	€2,350 – 3,000	€2,800 – 3,600	20-30%
Residential				
Estate House (Approx. 100m2)	€1,250 – 1,600	€950 – 1,200	€1,100 – 1,400	10-20%
Developer standard apartments	€1,600 – 2,400	€1,200 – 1,750	€1,600 – 2,100	10-20%

Table 3: Summary of average construction costs (Ireland) 2008, 2012 and 2016 (Bruce Shaw)
(Source Author 2016)

Published construction cost information provide by a leading Irish quantity surveying firm, Bruce Shaw, within their annual handbooks (Table 3) provides an indication of the extent of the effect of the recession on construction costs in Ireland. The percentages reported by Bruce Shaw for the mehanical and electrial services element of the project discussed appear to have remained constant, and are similar to those provided by McCaffrey (2010) (Figure 1) and Yusaf et al. (2012) (Figure 5), and so has not been shown on an annual basis.

S/No	Type of Building	Percentage of total Cost
1	Warehouse	10 – 15%
2	Apartment	15 – 20%
3	School	20 – 25%
4	Shopping Centre	20 – 30%
5	Hotel Development	30 – 40%
6	Office fit -out	35 – 45%
7	Hospital	40 – 55%
8	Data Centre	60 – 70%

Figure 5: Mechanical and Electrical services Costs as a percentage of Total Construction Costs, Malaysia (Yusaf et al 2012).

It is however worth noting the high percentage of cost related to mechanical and electrical services in health care as well as the various ranges for municipal buildings. These percentages coupled with the increase in construction costs noted in table 3 show the extent of cost increases currently being experienced, a sentiment which is shared by the SCSI (2016) when commenting on its tender price index. As noted by Cunningham (2014), Fogarty (2009) and by the OGP (2015) the PWC have not succeeded in providing cost certainty. The amendments outlined by the GCCC (2014) lack of cost certainty and the fact tender costs will increase. More important is the acknowledgement that the current tendering and appointment for specialist subcontractors is not sufficient. This had led to the recommendation for the introduction of a tender and contract for specialist contractors which specifically makes reference to mechanical and electrical specialists. It is envisaged that this recommendation be enacted where the specialist elements of the work account for 15 percent or more of the value of the project unless the specialist elements are of a relatively straight forward nature. The report also recommends that the early appointment of specialist contractors would be advantageous in certain projects where detailed design input were required. It is felt that this approach would go further towards cost certainty of government projects.

The OGP (2015) expands further on this second recommendation by noting that whilst novation of specialist contractors to the contracts will still exist that this new recommendation will allow for a traditional style of nomination following on from the employer's direct tendering procedure. This can occur in two distinct ways:

- A) The tendered price for the specialist works package is included within the Pricing Document if the specialist works tender is concluded prior to the issue of main contract tender, or secondly by
- B) The insertion of the specialist works tender sum as an adjust of the Main Constructors' Tender Sum in place of a predetermined PC Sum.

Whilst it appears that the process of nomination has been restored, the OGP does note that the employer will bring their tendering procedure up to the point of confirmation of the successful tenderer. However, the employer will not enter into a formal agreement of tender with the

specialist contractor. Another key point is that the employer's representatives will only be allowed to include PC Sums or Provisional sums with the prior approval of the GCCC and only where it was not feasible to fully establish the full cost of the nominated specialist works prior to the conclusion of the tender process in advance of signing the main contract. The OGP go on to cite the example of a *“specialist fit-out works of a large hospital prproject where the rate of technological development will not be conducive towards the awarding of the specialist contract at the same time as the main contrcat since the performance of the sub-contract may not take place for some years”*.

2.4.1 The need for early engagement with specialists.

The interim measures also acknowledge the need for early engagement of specialists. This again relates to those carrying out specialist works which require a significant design input. This is not a new concept as Pasquire (1994) has previously pointed out and states that *“the ultimate aim of changing the procurement approach is to make substantial cost savings”*. Pasquire goes further to discuss the ideal design procedure outlined by Gray et al. (1994) whereby the services consultant would commence the design during the concept and outline scheme stages with the specialist contractor during the detailed design. Pasquire describes the reality as one where *“the consultants produce an outline specification which seeks to included selected plant suppliers and or manufacturers”*.

The GCCC (2014) commented on the reduction of the level of consultants fees since the recession and made further comment on the reduction of quality in information being provided to works tenderers. This issue was raised by a number of takeholders including the CIF and the report confirms that this view is shared by many officials charged with the delivery of public works. The report goes refers to *“bidding fees being so low as to be unable to deliver a satisfactory level of service”*. Information gaps or insufficient consideration of complex designs may lead to cost overruns. Both of these are highlighted by Al-Hassan et al. (2006) whereby *“inadequate specification and incomplete drawings”* are noted as major contributory factors to inaccurate cost estimates.

2.5 Using Mechanical and Electrical cost data-bases in the future.

Brook (2008) discusses the early stages of cost planning using reliable historic data before defining the two main benefits of cost planning, namely;

“ To ensure tenders to not exceed the budget” and “to collect cost information from numerous buildings at various stages of development”.

The input of the design team at an early stage is required in order to ensure the integrity of the budget as changes can be integrated with minimum effect on the other elements. Cunningham (2014) lists a number of roles for the quantity surveyor including the preparation of approximate estimates of cost and cost planning at design stage. These are both described as

the precursor to the preparation of the bill of quantities. However, both Brook and Cunningham are speaking in broad terms and have not looked specifically at the mechanical and electrical elements of a structure.

When indicative cost ranges are used such as those published annually by firms such as Bruce Shaw, and referred to in Table 3, these generally outline the cost of the mechanical and electrical elements cumulatively as a percentage of the construction cost per m². These are the only elements to be treated in this manner and this stresses their importance. Murray (1997, p.127) notes the relevance of building services within existing buildings and the fact that 50% of construction income is generated by maintenance, improvement and refurbishment which contain large amounts of work to existing services. Murray also pointed out that the control of these costs is generally in the hands of the services consultant. The next step in the PWC is the introduction of cost planning for all publicly funded projects which will require early design input from all design team members in a more collaborative manner. Ashworth & Hogg (2000) make specific reference to client emphasis shifting from “*cost to value*” and that as a result many quantity surveyors are “*extending the range of services*” which they offer clients. Currently quantity surveying firms in the Republic of Ireland offer a whole suite of professional construction services with companies, such as Bruce Shaw, announcing the rebranding their company in order to highlight the diverse range of services on offer. Davies (2006) cited by Potts (2008) confirms this move to offering a diverse range of services and states that quantity surveying firms are providing “*strategic advice at a much higher level than was previously the case*”.

As technology changes so too does the requirements of the client and whilst the Irish Government has not, at the time of writing, instigated a programme or directive regarding the use of Building Information Modeling (BIM) in publicly funded construction projects it is to be expected. McAuley et al. (2012) advocate the use of BIM in publicly funded projects in Ireland as a cost saving measure and echo Cunninghams comments on the provision of value whilst going further to include the provision of whole life cycle costing. McAuley et al. (2015) advocate the wholesale use of BIM in all stages of the work from design through the construction and on to the operation of the building. This paper notes the need for effective communication in the design stage which is in line with the requirements of the PWC guidelines. Once mechanical and electrical systems are fully designed then the quantity surveyor can measure them. The use of BIM will allow for the use of on-screen measurement which is more prolific within the industry at present with many firms moving towards paperless operations and Cartledge (2006, p.232-5) describes the increased use of Information Technology in the quantity surveying office.

3. Chapter 3 – Research Methodology

3.1 Introduction

This chapter describes the methodology used to compile the research data for the purpose of the dissertation. The author goes as far as to use this chapter to reason the choice of methodology. Research can be defined as a quest for knowledge whereby a person needs to investigate an issue in a manner which strives to provide an answer. The mechanism for finding this answer is commonly described as the research methodology and those who undertake this task are generally referred to as researchers.

3.2 Research Aim

The aim of this dissertation is to investigate whether the Irish construction industry is ready to comply with the amended requirement of the Public Works Contracts to fully measure mechanical and electrical installations at tender stage in line with the Agreed Rules of Measurement 4th Edition (ARM4).

Research Objectives

The objectives of this research are defined out below:

- Critically evaluate current mechanisms for the quantification and tendering of mechanical and electrical services in both public and private contracts.
- Discuss the reasoning behind the amendment and the mechanism for its implementation
- Evaluate the ability of professional quantity surveyors to prepare bills of quantities for mechanical and electrical services.
- Discuss and analyse international best practice in relation to the measurement of mechanical and electrical services at tender stage.
- Access the current provision of training available in the Republic of Ireland for quantity surveyors involved in the quantification and costing of mechanical and electrical services.

3.3 Research Strategy

“The purpose of research is to discover answers to questions through the application of scientific procedures” (Kothari, 2004). Whereas, Crotty (1998) describes theoretical approaches as a way to observe, understand and explain the world. Both authors whilst years apart sought answers by various forms of questioning, a point to which Bryman (2015) gives merit when he advises that consideration research design can be confused with research methods especially as certain designs favour certain

methods. These designs are noted in figure 6 and defined below.

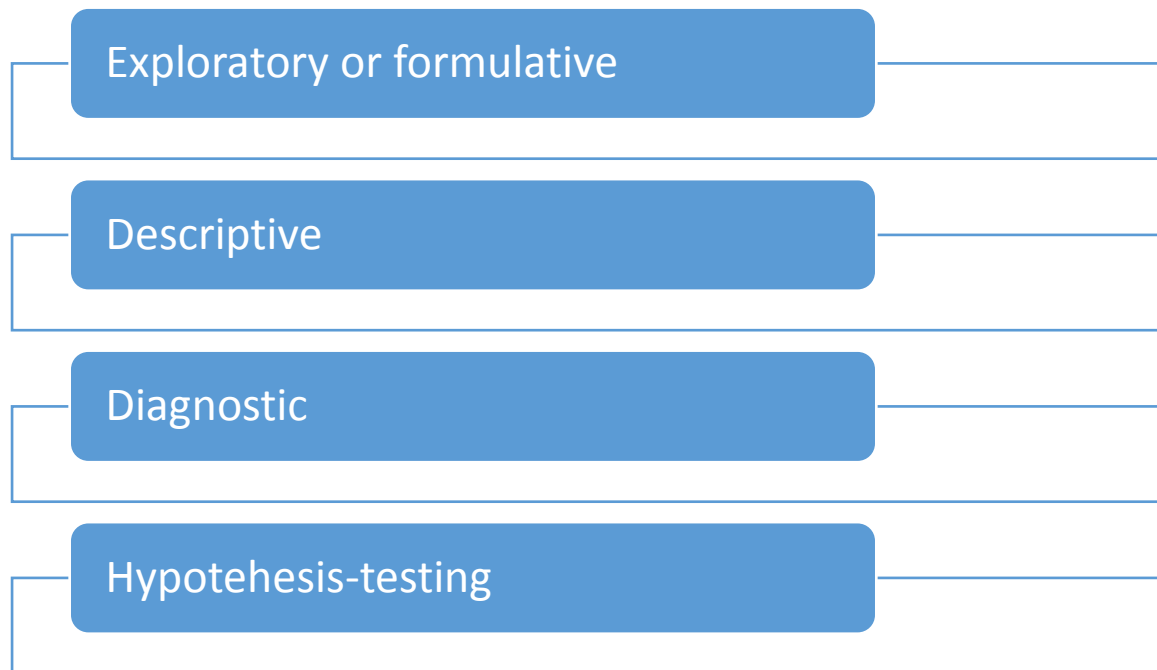


Figure 6: Research objectives (Broad Group)

(Source: Author, 2016)

Exploratory or formulative research studies are those studies where gaining familiarity or new insights into a phenomenon is the key objective.

Descriptive research look to portray the characteristics of the situation, group of individuals who form the basis of the study.

Diagnostic research seeks to determine the relationship between items or the frequency with which an item or event occurs.

Hypothesis-testing seeks to test a hypothesis (a statement created by researchers which speculates on the outcome of the research or experiment, (Shuttleworth, 2008)) of a causal relationship between variables.

The research within this study can be described as descriptive research as it seeks to review a particular situation, the introduction of the necessity to prepare mechanical and electrical bills of quantities in line with a prescribed method of measurement. The primary groups of individuals who are subjects to the research are the professionals preparing the bills of quantities and those who must depend on them at tender stage and during the project. This however does not define the research strategy which Naoum (2013) defined as “*the way research objectives can be questioned*”. The author will seek to define this strategy during the remainder of this chapter.

3.3.1 Research Hypothesis

Chambers Concise Dictionary (2015) defines a hypothesis as being:

- A statement or proposition assumed to be true or false for the sake of argument,
- A statement or theory to be proved or disproved by reference to evidence or facts,
- A provisional explanation of anything.

Fellows et al. (1997) refer to research beginning before the data collection has begun. However, they go further to note that irrelevant information may be gathered prior to the proposal being finalised. Crotty (2005, p.2) can be judged to agree with this as he notes reviewing the research methodologies to be proposed and the justification of their choice. The justification rests with *"the research question that our piece of inquiry is seeking to answer"*. With this in mind the author reflected on the topic in hand and his own experience. Within the construction process the mechanical and electrical services requirements had become more and more complex. In line with this the values of such elements of work had also increased. This led the author to choose this path of study as there appeared to be a limited number of quantity surveyors with this skill set. The research topic of this study came into existence when the Irish Government announced the implementation of the interim measures to the PWC. And so gave life to the question of this inquiry which falls into Chambers' second definition of hypothesis. The next stage is to define the methodology.

3.3.2 Quantitative Research

Muijs (2011) refers to quantitative data as the collection of numerical data and its analysis using mathematically based methods. Creswell (2014) considers this form of research to be an "objective" measurement of tangible data. Data is collected using strategies such as surveys and experiments which produce results in the form of numerical data. Interviews can also be used in this regard. The traditional approach to quantitative research can be defined by the term positivism. Muijs states that "according to positivism, the world works according to fixed laws of cause and effect". He also states that this is an extreme definition, whilst Crotty (2005) states that *"positivism is linked to empirical science as closely as ever"*. This is in line with Fellows and Liu (1997, p.61) who emphasise the need *"to record all data accurately and speedily, irrespective of the research methods adopted"* and stating that quantitative research is orientated more towards the collection and analysis of factual data.

3.3.3 Qualitative Research

Naoum (2013) and Fellows and Liu (2015) are quite similar in their descriptions of qualitative research whereby they refer to the experience of the individual(s) and the fact that such research may invoke emotions towards certain topics. Naoum goes further in that he discusses the exploratory and the attitudinal research approaches. Research which aims to explore new ideas where limited understanding or knowledge exists is known as exploratory research. Whereas attitudinal research is quite subjective to the attitudes of the individual(s) and seeks to evaluate attitudes, opinions and views using both closed and open ended questioning. Creswell (2014) includes observing as a qualitative research method and describes it as "a special skill that

requires addressing issues such as the potential deception of the people being interviewed”.

3.3.4 Mixed Methods Research

Naoum also states that there are two types of research namely quantitative and qualitative research. Other academics such as Denscombe (2008) and Anderson and Pool (2009) agree that a third strategy exists. This strategy is known as a mixed methodology and involves a mix of both qualitative and quantitative research. Creswell (2014) discusses making comparisons between the data from both qualitative and quantitative research for two reasons. The first is that it allows for “*triangulation*” between two or more research approaches. Secondly, it is of benefit where the research design is developing as the study progresses. Creswell compares this to a “*detective following a lead*”. Clark and Creswell (2008) outline the merits of this research approach while making reference to the disadvantage of combination of quantitative and qualitative methods. The disadvantage is that this combined form of research only allows for the primary and secondary rationales to be coded. This may not suit more complex research but appears to be satisfactory in this regard.

3.4 Research Method Adopted

The author has chosen to proceed with a mixed methods research approach for the basis of this dissertation as it was best suited to satisfying the aims and objectives of the research due to the following factors:

- The limited availability of data specific to Ireland;
- A perceived limited provision of the service of mechanical and electrical bills of quantities in Ireland based on the literature reviewed;
- Interviews provided the opportunity to obtain a more balanced overview based on more in-depth and complimentary data provided by individuals who are actively involved with the preparation and tendering of mechanical and electrical bills of quantities.
- A purely quantitative interview approach would be limited by the small number of participants who have had exposure to the implementation of the interim measures, from both the client and contractor perspective.

After due consideration of the factors noted above the author has arrived at the opinion that a mixed methodology is the best suited research methodology for this dissertation.

3.4.1 Secondary Data Research

Secondary data research is usually obtained by the means of a desk study approach whereby the researcher collects data from secondary sources through the use of existing literature. Naoum (2013) cites Stewart and Kamins (1993 p.37) noting that secondary data can be compared with new data in order to examine trends and deviations. Whereas Smith (2008) discusses the various definitions containing subtle differences but which refer to secondary

analysis as being analysis carried out on data collected by another source. Smith goes further to say that the secondary analysis need not be in the same manner but may take newer more novel approaches where deemed appropriate. With this in mind the author has analysed data collected by an industry representative body (CIF) and compared this to other areas of the research.

3.4.1.1 Desk Study – Literature Review

For the purpose of this research a desk study was undertaken which involved the review of primary literature on the subject matter and surrounding topics. This literature was sourced from books, conference papers, industry journals and web sites. The literature was used to give a historic view of the initial role of the quantity surveyor and the evolution of that role based on the changes seen within the industry. The literature also looked at commentaries on the effect of changes in technology and the more complex building design and client requirements. All items reviewed are rated based on how current the document is, how reliable the research appears, and the validity of the authority and the purpose of the document. Where older sources have been referenced they have been compared to more current sources in order to compare and contrast the material whilst seeking to ascertain if there has been significant change in the industry. Denscombe (2002) refers to the literature review having two functions; the first “*uses existing materials as the basis for showing the current research has something valuable to offer*” and the second concentrating on areas which have been overlooked by previous research.

3.4.2 Primary Research

Primary research can be defined as the collection of data by the researcher. Corbain and Strauss (2008) note the various alternative sources of data which qualitative research can utilise such as interviews, observations and drawings but to name a few. This view appears to be shared with Naoum (2013). With this in mind interviews were deemed to be the most advantageous method of primary research. A review of existing courses offering quantity surveying qualifications was also deemed important in order to define the current skills level within the current graduates entering the workforce.

3.4.2.1 Interview

Creswell (2007) refers to the collection of information using in-depth interviews in a similar manner to Naoum (2013) when he notes that interviews are best used where the study requires insight into opinions and experience. Corbin and Strauss (2008) referred to previous studies that they had carried out and noted that unstructured interviews were their preferred interview method but that when sensitive situations arose there was a need to have structured interviews in order to facilitate data collection. Denscombe (2002) highlights that data collected from social research “*relies on information collected directly from people, on people, about people*”. With this in mind co-operation is seen to be vital. Commentators such as Brinkmann (2013) advocate the use of semi-structured interviews in qualitative research. This is a more formal

approach than the unstructured interview and allows the interviewer to use both open and closed ended questions to elicit answer on specific issues whilst obtaining the interviewee's perspective. Both Denscombe (2008) and Naoum (2013) agree that this allows the interviewee to elaborate on their answers by providing further information where required.

The semi structured interview method was chosen for this research project as commentators on the government contracts have been quite vocal with their opinions since the introduction of the PWC. The author believes that the effect of the implementation of interim measures 1 & 2 will have an effect on both the quantity surveyor and the mechanical and electrical contractors. The effects will not necessarily be the same for either side in all instances. As a result the introduction of these measures is a radical departure from the traditional procurement and estimating procedures for these packages of work. The interviews were carried out with participants from both the quantity surveying and contracting sides as well as a senior member of the OGP, who are charged with the implementation of the measures, and a representative from the CIF, who lobbies on behalf of the contractors. The interview participants were chosen based on their standing in industry and exposure to the interim measures being investigated. All are involved in the various aspects of measurement and tendering of government funded construction projects. Kvale (2007, p.10) notes that "elite interviews" with individuals who are leaders within their communities or professions will provide an educated outcome to the research. Whilst some of the participants have attempted to measure and / or price bills of quantities none have yet fully implemented the proposed interim measures for various reasons.

3.4.3 Data Collection and Analysis

All interviews and analysis were conducted over a 4 week period between July and August 2016 using face to face semi-structured interviews. This is in line with Marshall and Rossman (1989) who advocate the process of data collection and analysis being carried out simultaneously in qualitative research. This mechanism was deemed suitable for the purpose of interviewing the list of interviewees as all are based in Ireland with the majority concentrated within the greater Dublin / Leinster area. Over the last number of years the majority of government funded construction projects have been based around the greater Dublin / Leinster area. Interviewees were primarily sent a letter of invitation along with an information pack outlining the extent of the study. Once the interviewee participation was agreed a consent form and a copy of the questions were forwarded to the interviewee prior to the interview (Appendix B). All interviews were recorded using a digital recording device and transcribed by the author. Permission was sought via the consent form to record each interviewee with no objections.

3.4.4 Ethical Considerations

The responsibilities of researchers and participants, as well as the wider research community, are set out in the ethical guidelines of the British Educational Research Association (2010). The author has set out to abide by these guidelines as well as those set out by the University of Salford. Creswell (2014, p.100) noted one essential ethical consideration when he advised

researcher to “*avoid disclosing information that could harm participants*”. The author has acknowledged this when approaching prospective participants and when carrying out the interviews. Whilst the subject of the study is based on industry sentiment regarding the effects of the implementation of client orientated requirements on government contracts the author is aware that participants may make comments regarding commercially sensitive aspects of their business. In order to express these considerations each interviewee was issued with a letter of approach, an information sheet and a consent form outlining the approach to the research the ethical considerations being made. Prior to the interview a copy of the interview questions were provided to the interviewee. The results of the CIF confidential poll were provided for use by the CIF and have not yet been published. Permission was sought by the CIF from, its contributors, to use this anonymous information and to disseminate it by various means including this study. Kehily et al. (2012) discuss a Whole Life Cycle Costing approach to BIM and the painting example provided is based on the use of indicative figures from a cost database. In order for this to logic to be applied in the case of mechanical and electrical systems its will be necessary for the quantity surveyor to have a firm grasp of both the technology and costs of the various elements of the mechanical and electrical services within any given project.

3.4.5 Limitations to methodology

The methodology adopted proved to have certain limitations which became obvious during the course of the research. The first was the lack of recent relevant literature on the subject. Whilst literature was available the sources were generally dated or in the case of the more recent literature the information related to areas of Africa and other regions where the role of the quantity surveyor or construction cost consultant may not be on a par.

Furthermore the level of expertise in the preparation and use of bills of quantities for mechanical and electrical services on government funded projects is limited to a very small number of professionals on both sides of the industry. This meant that some of the interviewees originally proposed were not able to comment on the interim measures. As a result the interview process was extended longer than originally anticipated by the author.

3.4.6 Conclusions

This chapter provided the author with the opportunity to evaluate and define the process of collecting and analysing the research data. A mixed methods approach to the research was decided upon which incorporates a desk study in the form of a literature review, a review of all existing quantity surveying courses in the Republic of Ireland and semi structured interviews. It is the opinion of the author that each objective is achievable by adopting the mixed methodology approach.

4. Chapter 4 – Research Analysis and Findings

4.1 Introduction

This chapter presents the findings of the semi structured interviews, the analysis of the CIF poll and the review of the Level 8 and Level 9 quantity surveying programmes as described by the National Framework of Qualifications (NQF). The results and analysis of the semi structured interview are presented in a commentary format whilst the poll results are represented in a graphical format. The findings of the review of third level quantity surveying programmes is formatted in a tabular manner. All survey results and interview transcripts are included in appendix B and C respectively.

4.2 Interviews

The interview process provided the author with a critical insight of the opinions of 11 separate industry stakeholders. These interviews allowed the author to gain an understanding of the various opinions within the construction industry in Ireland. The interviewees included:

Interviewees			
Participant A	David O'Brien	Office of Government Procurement	Construction Advisor at the Office of Government Procurement
Participant B	Sean Downey	Construction Industry Federation	Director of Construction (Specialist Contracting)
Participant C	Paul Dunne	Dublin City Council	Chief Quantity Surveyor
Participant D	Alan Duffy	Alan Duffy QS	Director
Participant E	Owen Hearty	HKN-QS	Managing Director
Participant F	Andrew Nugent	Andrew P. Nugent & Associates	Managing Director (Immediate past president of the SCSI)
Participant G	Dave Byrne	Mercury	Bid manager for Ireland, UK and Mainland Europe
Participant H	Gerard Ryan	XPL Ltd	Surveying Manager
Participant I	Brian Travers	Suir Engineering	Quantity Surveying and estimating team
Participant J	David Hughes	Turner and Townsend Ltd (Dublin)	Associate Director (M&E QS)
Participant K	Niall Bourke	T. Bourke & Co.	Managing Director

Table 4 - Interview Participants

(Source: Author, 2016)

The use of a semi-structured interview format allowed each interviewee to develop and

elaborate each of the answers they provided.

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

Chapter 2 of this research sought to give an understanding of the origin of the PWC and found that the emphasis was on the fair transfer of risk and providing cost certainty as well as value for the client. Firstly, this question was aimed at establishing the sentiment around risk transfer as it originally existed and how it would be perceived to change. Secondly, this question sought to establish the opinion of those interviewed in relation to the amended PWC contracts being able to provide better delivery and value for the client. All interviewees bar one believed that Interim Measure 1 would aid in the delivery of projects and add value for the client but the reasons varied. Some, such as Participant A noted that the introduction of measured bills of quantities into the PWC at this stage should increase the standard of the tender documents and prevent the occurrence of third party disputes. He also noted that the previous system of risk transfer was not always fair to the contractor. This view is shared by Participant C whilst Participant B goes as far as to say that *“this could lead to better project and contract risk management”*. Many of those interviewed believed that the introduction of the bill of quantities would aid in the valuation of variations and prevent a number of disputes from being wrongly elevation to through the dispute resolution procedures. Both Participants D and F welcome the change with Participant D believing that the *“previous system was unworkable”* and Participant F stating that *“the pendulum had swung too far back with the initial draft of the public works contract”* in relation to risk transfer.

Participant G believed that the introduction of the bill of quantities would not add value due to the re-measurable status of the contract. This comment is made on the basis that the quantity surveyor may miss something in the preparation of the bill of quantities which would have been deemed included in the works requirement document. Participant G believes that such errors *“will leave the client open for any variation”*. This is a sentiment shared by Participant K who feels that the extension of the measurement of mechanical and electrical packages within the bill of quantities will provide the client with a better mechanism to control costs of the mechanical and electrical contractor through the management of the main contractors’ claim orientated nature. Participant A states that the government wasn’t to *“identify errors and address them as compensation events without going to disputes”* and did not *“believe this to be in the best interest of project delivery”*. The later view is shared with many of the interviewees.

Both Participant E and Participant F make reference for the need for complete design information at tender stage. Participant F goes as far as to that *“intention of [the] public works*

contract in driving the design earlier was a positive move but it didn't happen on many projects”.

Based on the responses received it is to be noted that the general view of those interviewed was that the revised risk transfer mechanism is to be welcomed for various reasons based on the interviewee's perspective. The negative commentary comes mainly from the specialist contracting perspective whereby the opinion expressed was that the inclusion of the measured mechanical and electrical packages did not serve all parties equally. Most of the interviewees were very specific on the benefit in defined rates, with all noting their use in the valuation of variations and change orders.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

The literature review in Chapter Two refers back to industry and academic commentators who outlined two main reasons for the services consultant engineer being the design team member responsible for the tendering and cost control of the mechanical and electrical elements of the project. The first being that the consultant services engineer did not wish to relinquish control and the second being that the technology involved within the various installations was generally outside the skill set of the quantity surveyor. This questions sought to obtain the views of the interviewees on why the government has decided to change from this traditional approach. As Participant A is in a position to rationalise the change from the government perspective and notes that the quantity surveyor is *“uniquely positioned to understand what parts of the information is missing”*. He goes on to state that *“the logical extension is that we [government] want to bring that person back into a key role”*. Participant B believes that the *“competent cost controller”* will be allowed to *“fulfil his obligations with the technical support of the rest of the project team”*.

All of those interviewed were in agreement that the one point of control within the cost function is a construction project was ideal and paramount to the project. More surprisingly was the consensus that the quantity surveyor was the profession best suited to carry out this function. While some consulting services engineering firms do carry out the function it was agreed by the parties that this was not a normal service and that the engineering firms were designers first off. The ability of the quantity surveyor to interrogate the information within the services

drawings and specification was raised as a barrier to this aspect of the interim measures but not an overriding one. This will be dealt with in later questions.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

A) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

The implementation guidelines relating to the introduction of the interim measures can be judged to have given mixed guidelines for the need to measure the mechanical and electrical elements of the works which are procured under Interim Measure 2. This lead to the question in hand. All of the participants believe that the introduction of direct tendering to named reserved specialist contractors will not negate the need to measure the packages in question. The reasons for the answer varied depending on the viewpoint of the respondent. Participant A is of the opinion that whilst it may allow the return to a lump sum at tender stage that it will not negate the need to measure as a whole. Participant E and Participant J are in agreement with this sentiment in so far as they both share the belief that the way in which some specialist items within the mechanical and electrical packages are procured will mean that smaller lumps sum items will be inserted into the bill of quantities where it is not possible to measure fully. Other responses such as that from Participant K noted that the measurement is in as a result of the amendments and so will be used. And Participant G believes that the tendering of the reserve specialist will encourage the measurement of mechanical and electrical works within the bill. Some responses such as that from Participant C note that the procurement rule does allow scope for the misunderstanding of procurement at present but the intention is that it should be measured.

In this instance all of those interviewed saw no reason(s) why mechanical and electrical services should not be measured when tendering directly. The interesting point is that it was mainly those who act on behalf of the client who made comment about the need to be able to adjust the measurement rules to suit the type of systems being measured so as to be more practical in the production of the bill of quantities.

B) Will this aid in providing cost certainty for the Client at an early stage of the project?

The PWC suite of contracts are all about providing cost certainty to the client. This was the initial intention in 2007 which never manifested itself. Now, with the current departure from lump sum fixed priced contracts in contracts effected by the interim measures it appeared justified to question the ethos of cost certainty for the client regarding the influence of direct

tendering of reserved specialist contractors. Again the answer to this question was a resounding yes but for various reasons or with caveats. Participant A says that the Government has spoken to Public Sector Clients and informed them that the interim measures will bring higher costs at tender stage but that this will be offset by the “*expected better quality of output*”. This view point is based on Government not being a speculative developer but rather approaching construction as an asset management fund seeking best use over a specific period. Participant K is the only other party to raise the topic of increased costs noting that this strategy will allow the mechanical and electrical specialists the opportunity to price as near to a realistic cost on government projects for the first time since the introduction of the PWC. Other responses from those involved on the contracting side believe that a properly produced bill of quantities prepared by someone with the requisite knowledge will be of use in providing cost certainty. This sentiment comes with the caveat that the design must be complete. Participant G believes that the quantity surveyor will need “*to make the designer their friend*” in order to ensure that there are no “*gaps in the bill*” as these “*will cause issues*”. The client is part of the solution here in that the design can only be complete if the client has defined their requirements from the outset. Others on the client side believe that they will be in position to report on these costs to their clients earlier and with more certainty without worrying about large increases in the values as the project continues.

While all those interviewed are satisfied that the Interim Measure 2 will aid in the provision of cost certainty for the client they are all aware of the potential pitfalls that lie in wait regarding the completeness of the design and incomplete bills of quantities. The fact that the Public Sector Clients are aware of the impending increase in cost is of interest but was not something which was raised by many of those interviewed. The introduction of BIM was noted by some as possibly being an aid in this matter. However, in the interim a more collaborative relationship between the design team members may be the necessary first step.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

A) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

The implementation guidelines published by the OGP, and discussed in Chapter 2, seek to allow an 18 month period for the upskilling of the quantity surveyor in relation to the measurement of services. Discussion with Participant A reveals no specific rationale behind the selection of this period other than the fact that it appears a reasonable first step. All parties interviewed are of the opinion that the use of the ARM 4 is not the issue for the quantity surveyor producing the bills of quantities. The problem lies in the quantity surveyors’ technical

knowledge of the services to be measures and the resulting ability of the quantity surveyor to interrogate the design in a manner which will allow for the production of a satisfactorily complete tendering document. Participant A believes that the timeframe is not set in stone and will move as the industry adapts. Whilst other participants, mainly quantity surveyors, believe that those who commit to upskilling will make the change within the defined period. On the contractors side the response is different though with Participant K stating that the quantity surveying consultants will “*be taking the M&E estimators and training them as surveyors*” in order to be able to compete in the market place.

The consensus seems to be that the time frame is sufficient for those who commit to the upskilling but that it may be easier for some rather than other based on their current role in industry.

B) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

This question relates to the method of measurement to be used and the fact that two such methods exist within the interim measures. The ARM4 is the full method of measurement whilst the Supplement 2 is a simplified version. Four of those interviewed noted that they are not directly involved within the measurement of services using the ARM4 or the Supplement 2 at present and so may not be the best to answer this question. Others such as Participant C noted that the Supplement may be suited to small domestic type installations. Others believe that the Supplement does not go far enough and as such would prefer to use Sections M & N from the offset. The more vocal contractors believe that Supplement 2 will evolve and become the primary document and that sections M & N provide too much unnecessary measurement.

There are two very well defined camps in this part of the discussion. The client’s side of the discussion would like to see the full ARM4 used for the productions of bills of quantities while the contractors’ side believes that the Supplement is a good starting point which will be adapted to suit this sector of industry as time goes on. The main point of agreement is that neither document in their own right is fully fit for purpose at this time.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

Literature reviewed in Chapter 2 has shown that the quantity surveyor has generally avoided the quantification mechanical and electrical works. The contracts discussed have not imposed

it but rather allowed the practice of tendering by way of drawings and specification. The majority of the interviewees were not surprised by the findings and believe that the main reason for the difference is that the situation did not arise where it had been deemed necessary for such works to be measured by the quantity surveyor. Participant A noted that some bills of quantities were produced by some state agencies but not in line with any prescribed method of measurement as they were not happy with the ARM. He goes further to note that none of the professional bodies such as the SCSI or CIF were very vocal on the issue. Participant B is of the opinion that most parties have found the bill of quantities too time consuming to prepare whilst others such as Participant K believed that the quantity surveyors have never had sufficient knowledge to allow them to prepare the bill and so rarely did. This seems to be a view shared by many of the interviewees.

The main finding is that tradition and the lack of technical knowledge on behalf of the quantity surveyor seem to be the main reason for the difference seen in the poll. This is in line with the commentaries reviewed in Chapter 2.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

The traditional practice with specialist works measured within bills of quantities has been to provide brackets alongside measured items and to give a lump sum for a range of items. This question seeks to examine the industry thinking on the requirement to price all aspects of the mechanical and electrical bill of quantities. Participant A believes that this will be challenging but worthwhile for a number of reasons including new payments legislation recently introduced and the collection of cost data. This view is shared by many of the interviewees. Some of the participants believe that it may not always be possible to provide a full break down due to the nature of the industry, however well it is measured. Many of those interviewed agree with Participant F who noted that the ARM and work sections M & N need to be reviewed. Whilst others, such as Participant K, believed that the expansion of Supplement 2 in line with estimating practices within the mechanical and electrical sections would be the best option.

Generally the consensus is that the practice of pricing all items of the bill of quantities will occur but not without some compromise in relation to the production of the bill of quantities. This move is welcomed based on transparency and in conjunction with the introduction of the Construction Contracts Act 2013, which does not form part of this study.

4.3 CIF Poll

In preparation for the introduction of the interim measures the CIF hosted five half day seminars in conjunction with the Mechanical and Electrical Contractors Association. These events were hosted in order to explain the effect of interim measures 1 & 2 on the tendering procedures in the PWC and to introduce the attendees to the proposed standard method of measurement, including Supplement 2. In all 76 people attended these seminars and all attendees were involved in the surveying and estimating function of mechanical and electrical firms who undertake works in the public sector in Ireland. The poll itself was optional and received 55 responses. The data provided by the CIF poll has not yet been published or analysed other than in the context of this research.

SURVEY RESPONSE RATE	
Survey provided to	76
Returned Surveys	55
Response Rate	72%
Returned Surveys fully completed	100%

Table 5 - Survey response rate (Source CIF, 2016, not reported)

The poll comprised of two short question which sought to determine which area of the sector the attendees belonged to and what were the primary reference documents provided to them at tender stage.

Question one determines the area of the sector by asking the respondent to state which area they primarily operate in.

- A. Mechanical
- B. Electrical
- C. Both Mechanical and Electrical

Question 1: I primarily operate in the following sector.

Sector	Quantity	Percentage
Mechanical	24	44%
Electrical	26	47%
Both Mechanical and Electrical	5	9%
Totals	55	100%

Table 6 – Question 1 Responses

(Source, Author 2016)

The results provided are tabulated above, Table 6, and graphically represents below. The data collected shows that there is a strong interest in both groups regarding the effects of the

amendments on their operating procedures.

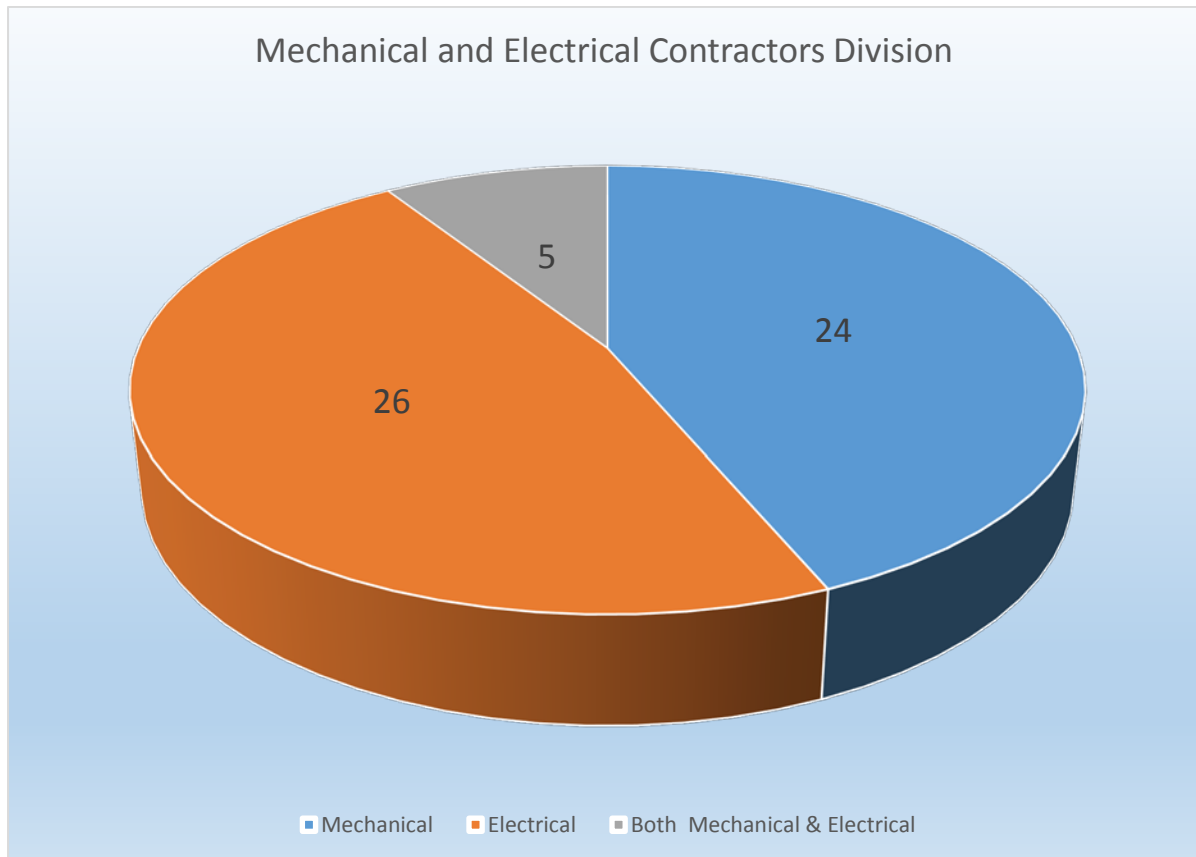


Figure 7- Question 1 - Primary sector of operation

(Source – Author 2016)

Question 2: When pricing work we typically use the following as our primary reference document:

- A. Bills of Quantities (BoQ)
- B. Drawings
- C. Performance Specifications
- D. Others (please indicate)

This is a more in depth question and seeks to establish what primary reference documents are generally provided to the specialist sub-contractors in these sectors at tender stage.

Reference Document	Number	Percentage	% of Respondents (55)	Ranking
Bills of Quantities	11	11%	20%	3
Drawings	53	53%	96%	1
Performance Spec.	32	32%	58%	2
Other	4	4%	7%	4
Total	100	100%	NA	NA

Table 7 - Question 2 responses

(Source, Author 2016)

It should be noted that respondents were allowed to choose as many responses as necessary in this question and it is apparent from Table 7 above that many chose multiple answers. This does not take away from the overall rankings in the right hand side of the table which shows that bills of quantities is the third most used tendering option for mechanical and electrical services. The other results to this question were somewhat surprising as the author had a preconceived notion that performance specification would be the leading response. However, as you examine the table of responses you will note that the majority of respondents noted that they tendered primarily from drawings.

Where others has been chosen the responses noted schedules of rates and consultants pricing documents as being the primary tender document. Some may argue that these are actually variants to a bill of quantities and if this thought process were applied the final rankings would see the removal of the classification of “other”. This would not change the ranking of bills of quantities but would now see them placed last in a three horse race.

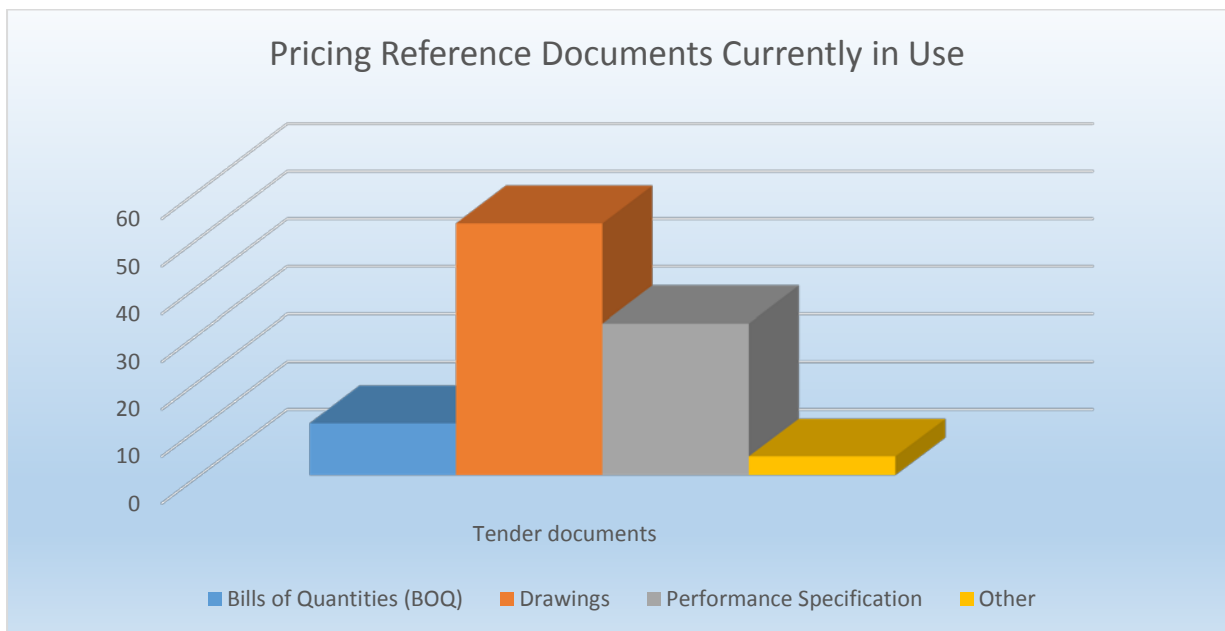


Figure 8 - Question 2 Responses

(Source, Author 2016)

4.4 Quantity Surveying Courses in the Republic of Ireland

4.4.1 Undergraduate quantity surveying programmes

This section of the research seeks to identify the sources of education for quantity surveyors in the Republic of Ireland and to identify the extent of training available to students both at undergraduate and post graduate levels.

Table 8 (below) identifies each of the undergraduate quantity surveying programmes currently available in the Republic of Ireland both at level 7 (ordinary degree) and level 8 (honours degree). It is apparent from the table that the majority of level 8 programmes are accredited by the SCSi. This provides all successful graduates the opportunity to commence their Assessment of Professional Competency (APC) in order to achieve chartered status. It is worth noting that graduates of non-accredited by the SCSi have to wait 10 years post-graduation before being permitted to commence their APC. Successful APC candidates are automatically entered onto the Irish register of quantity surveyors as established by the Building Control Act 2007. Inclusion on this register is generally deemed to infer that the named quantity surveyor is a “competent construction cost consultant” as referred to the OGP in their guidance notes on the implementation of the interim measures.

Institution	Course	Duration	M&E Module	NFQ Level	SCSI Accreditation
Limerick Institute of Technology	BSc (Hons)Quantity Surveying	4 year full time	1 semester	8	YES
Institute of Technology Sligo	BSc (Hons) Quantity Surveying	4 year full time	NO	8	YES
Cork Institute of Technology	BSc Quantity Surveying	3 year full time	NO	7	NO
Cork Institute of Technology	BSc (Hons) Quantity Surveying	4 year full time	1 semester (Elective)	8	YES
Waterford Institute of Technology	BE (Hons) Quantity Surveying	4 year full time	None Defined	8	Yes
Institute of Technology Carlow	BSc (Hons) Quantity Surveying	4 year full time	None Defined	8	NO
Letterkenny Institute of Technology	BSc (Hons) Quantity Surveying	4 year full time	NO	8	YES
Galway Mayo Institute of Technology	BSc (Hons) Construction and Quantity Surveying	4 years full time	YES	8	YES
Dublin Institute of Technology	BSc (Hons) Construction Economics and Management (Quantity Surveying)	4 year full time / 5 year part time	YES	8	YES

Table 8: Undergraduate programs in the Republic of Ireland

(Source, Author 2016)

Based on the information available at the time of writing there are 9 undergraduate quantity surveying programs in Ireland all provided by various Institutes of Technology. Of these programmes 8 are level 8 programmes, with 7 being accredited by the SCSi. Whilst this information is of interest to both interested applicants and employers the more important information found during this research is that only 4 of the programs have modules dedicated to developing the skill of mechanical and electrical measurement. On further examination of the programs offering these specialist measurement modules appear to only offer these modules as 5 credit modules which equates to no more than 100 learning hours, These 100 hours comprise of student contact hours and self-directed learning hours. The institutes of technology generally teach 5 credit modules over one semester which is roughly 12 weeks long.

Quantity Surveying Undergraduate programs	9
Accredited Courses	7
Non Accredited Courses	2
Defined M&E Measurement Modules	4

Table 9 – Under graduate Quantity Surveying Course Summary

(Source, Author 2016)

4.4.2 Postgraduate quantity surveying programs

Table 10 (below) identifies the 3 post graduate quantity surveying courses available in the Republic of Ireland. These programs are offered in order to fulfil various needs. One of the course is a bespoke programme for those looking to specialise in mechanical and electrical quantity surveying. A minimum entry requirement is that prospective candidates have a level 8 quantity surveying degree. Another course is a conversion masters which allows those working in relevant positions within the construction industry to convert to quantity surveyors. This is an accelerated programme. The final programme is a master's programme ideally suited to those looking to progress towards more commercially orientated roles in the industry. It is a minimum entry requirement of this final course that all prospective applicants be qualified quantity surveyors or have significant construction cost control experience.

Institution	Course	Duration	M&E Module	NFQ Level	SCSi Accreditation
Limerick Institute of Technology	MSc Quantity Surveying (Sustainable M&E Engineering)	1 year full-time / 2 years part time	YES	9	YES
Dublin Institute of Technology	MSc Quantity Surveying (Conversion)	2 years part-time	NO	9	YES
Dublin Institute of Technology	MSc Applied Construction Cost Management	1 year whole time	YES	9	NO

Table 10 - Post graduate programs in the Republic of Ireland

(Source, Author 2016)

Of these three courses advertised and noted above two are accredited by the SCSi whilst the third is recognised as complimenting an accredited undergraduate programme. Two of the programs have specific mechanical and electrical quantity surveying and technology modules which make up between 10 -20 credits of these programs. Both of these programs are advertised on an annual basis but neither have been active in the last 2 years due to low number of applications. The MSc Quantity Surveying (conversion) offered by the Dublin Institute of Technology has run every year since it was launched and is seeing a number of professionals in the mechanical and electrical services sectors undertaking the programme.

Quantity Surveying Postgraduate programs	3
Accredited Courses	2
Non Accredited Courses	1
Defined M&E Measurement Modules	2

Table 11 - Postgraduate quantity surveying course summary

(source, Author 2016)

4.5 Conclusions

This chapter identified the key findings and aids in the provision of discussions by way of a primary data research. The author sought to compare the findings of this study with those of the literature review by obtaining and analysing stakeholders' opinions regarding the introduction of the interim measures. Some of the commentary identified barriers and drivers which were compared to those within the literature review. The inclusion of the CIF poll helped to identify the traditionally used procurement route in services procurement. The review of the quantity surveying courses helped to identify the level of education, in relation to services, which constitute part of the standard education for quantity surveyors in the Republic of Ireland.

5. Chapter 5 – Conclusions and Recommendations

5.1 Introduction

This chapter will discuss the aims and objectives of this dissertation. The main findings are summarised and evaluated in order to provide overall recommendations and conclusions. The chapter will conclude with an overview of limitations to the research and suggest areas of further research.

5.2 Dissertation Aim

The aim of this dissertation was to investigate whether the Irish construction industry is ready to comply with the amended requirement of the Public Works Contracts to fully measure mechanical and electrical installations at tender stage in line with the Agreed Rules of Measurement 4th Edition (ARM4).

5.3 Dissertation Objectives and Findings

Critically evaluate current mechanisms for the quantification and tendering of mechanical and electrical services in both public and private contracts.

This objective was primarily achieved by reviewing the secondary resources by way of published literature. This information was supplemented by the CIF poll and the interviews. The poll aided by providing a more up to date overview of the situation.

The literature showed that the suggested that the traditional approach was to tender the projects to the specialist contractors who quantified the works during their own estimation process and then returned a priced form of tender. This seems to be long established practice and one which is shared, recently, by other countries as noted by Dada and Jagboro. The survey results provided show that the mechanical and electrical contractors have had limited exposure to measured bills of quantities to date. A view shared by some of the interview participants who described their own experience in pricing bills of quantities over the course of their careers. The use of measured bills of quantities, in particular those measured in conjunction with a standard method of measurement, is limited in the Irish construction industry.

Discuss the reasoning behind the amendment and the mechanism for its implementation

The literature review deals predominantly with this objective and defines the Government's desire for cost certainty as the predominant factors behind the amendments. Whilst the interviews look at the experiences of the parties and their expectations in relation to the amendments.

The timing of the publication of the initial draft of the PWC meant that the contract was not

always enacted by the tendering bodies in the manner in which the GCCC envisaged. In certain circumstances all risk was transferred to the contractor even in cases where the tendering body would be seen to be responsible. Whilst the contracts allowed for the risk to be transferred and for the contractor to price in this risk it appears that contractors took the decision to ignore pricing the risk and to become claims conscious. This was aided by low standards of tender documentation as noted by several of the interview participants and in the various Government documents reviewed. Mechanical and electrical services have been singled out due to the large value of the works and the often complicated systems associated with these installations. Interim Measure 2, in itself, spoke volumes in this regard whereby the client could tender directly to the specialist subcontractor where the works constituted a substantial part of the works or where the installation was of significance to the operation of the building. The general view of the need for one point of control becomes apparent in both the literature review and in the discussion with the interviewees. All believed that the quantity surveying profession was best suited to manage the overall cost of the project. However, all parties are aware of the quantity surveying profession's lack of technical knowledge in this field and are in agreement that a period of upskilling is required. There is no firm agreement that the proposed time frame is sufficient. The use of the Supplement 2 in lieu of the full ARM 4 in the interim period is not wholly welcomed due to the limited nature of the document. On the other hand most of the parties do not feel that the full ARM will serve a mutually beneficial role.

Evaluate the ability of professional quantity surveyors to prepare bills of quantities for mechanical and electrical services.

The literature discussed in chapter 2 shows that the common barrier to the competent measurement of mechanical and electrical services is the lack of technical knowledge on behalf of the quantity surveyor. This coupled with incomplete designs prevent sufficient measurement capable of producing adequate bills of quantities. This is not a new phenomenon. The survey results show that fully measured bills of quantities have rarely been produced in relation to mechanical and electrical and services in Ireland. The interviews confirm the lack of technical knowledge as the main barrier to the quantity surveyor producing bills for these elements of the works. Furthermore those interviewed from the contracting side have acknowledged that the quantity surveyor is best placed to control costs but have a long road ahead in relation to upskilling on the technology side. Some of those interviewed believe that the best services quantity surveyors will be contractors' estimators who are hired by the quantity surveying firms and facilitated in converting to the profession.

Discuss and analyse international best practice in relation to the measurement of mechanical and electrical services at tender stage.

The literature reviewed in chapter two provided some insight in this regard but did not provide a true conclusion. The general tender practice for construction projects seems to have moved towards lump sum fixed price contracts for construction works based on drawings and specifications. The Irish construction industry provides for both re-measurable and fixed price contracts in a manner quite similar to many other countries. Most of the literature discussed the need to better control the cost of mechanical and electrical services particularly where the cost represented a large proportion of the works as noted in Table 3 and Figure 5. A review of literature relating to the industry as a whole and attempts to modernise measurement practices in other countries confirmed that practices around the world have been quite similar for many years. One of the interview participants has had experience in the Middle East and was able to offer some interesting perspectives including the need for the Irish industry to look at ways to simplify the measurement while making it more practical. This included the requirement to review the ARM4 and bring its rule in line with industry practice. Changes appear to have only taken place on projects where the majority of the cost is centred around the services elements and not on works as contracted for under the Irish PWC.

Access the current provision of training available in the Republic of Ireland for quantity surveyors involved in the quantification and costing of mechanical and electrical services.

This part of the research is supported by the secondary research into the quantity surveying courses provided in the Republic of Ireland at both undergraduate and post graduate level. Whilst a range of course were available at undergraduate level only four of the nine programmes available provided any mechanical and electrical technology and / or measurement modules. Where these were provided they equated to no more than 5 ECTS credits which meant that the student received no more than 100 hours of instruction over a 12 week period. This includes class time and self-directed learning hours by the student themselves. Only one of the programmes offers a part time version of their programme, whilst one offers its final year on a distance learning basis.

At postgraduate level there are three programmes advertised with two having a minimum of 10 ECTS credits in mechanical and electrical technology and / or measurement modules. However, these two programmes have not run in the last two to three years. The one course which has run does not offer any mechanical and electrical technology and / or measurement modules. It is a conversation masters and advertises itself as being suitable for those with level 8 degrees working within the construction industry and looking to become quantity surveyors.

This is in line with some of the opinions voiced by interview participants. In general however, this part of the research shows that there is no real academic aid available to industry in relation to upskilling the quantity surveyor in the field of mechanical and electrical technology or measurement.

5.4 Recommendations

Based on the conclusions of the literature review and the findings of the survey, interviews and review of college programmes available the following recommendations are made to aid in the implementation of the measurement of mechanical and electrical services under the PWC in the Irish construction industry.

Review of the ARM4

The ARM4 including the supplement two requires serious review in relation to their role in the measurement of mechanical and electrical services. The opinions of the interview participants were quite strong in this regard with many noting that Supplement 2 was insufficient and possibly a waste of time. While most commented that the ARM4 sections M and N required over measurement which did not reflect works practices in this sector of the industry.

Education

Whilst both the CIF and SCSi have held briefings for their members these have taken the form of half day or two day workshops which provided an overview to the membership. These were of benefit to the membership of both organisations in that they highlighted the amendments and the need to upskill. However, there appears to be no move forward presently at this point and those looking to upskill do not know where to turn. One interview participant noted that he cannot find part time courses for his staff to facilitate training while working. Moving forward the professional bodies should seek to work with the academic institutions to organise programmes which allow for the upskilling. This will include adapting the existing undergraduate programmes and finding mechanisms to run the relevant post graduate programmes on part time or distance learning basis to encourage existing staff to upskill. The existence of conversion masters programmes may help to produce some quantity surveyors in the short term but even these professionals are in short supply. Once quantity surveyors are in a position to specialise in the measurement of such services the incorporation of this work into the bill of quantities will extend into private projects also.

Collaboration

There exists in the construction industry a need to encourage collaboration, not just between the contracting parties, but, between the design team themselves. This has been made apparent in the interviews and the literature review. More collaboration will aid in making the design

more integrated and limit claims while increasing productivity.

5.5 Limitations of the Research

The lack of investment in upskilling with regards to the measurement of mechanical and electrical services became evident during the literature review. The texts regarding mechanical and electrical measurement were generally dated, whilst the more recent were limited to the practices of quantity surveyors and cost consultants in places like Nigeria and Malaysia to name a few.

In terms of the interviews it quickly became apparent that none of those approached would be affected by the interim measures as their companies were not engaged on Public Sector projects. This reduced the number of possible interviewees and extended the period for conducting the interviews.

Regarding the review of the existing college programmes available it was difficult to find too much information as the most of the colleges did not have their full module catalogues available on the websites. As the research was carried out during the period of the college summer holidays (June 19th – September 1st) no course administrators were available for comment.

5.6 Further Research

Following on from this research the author suggests research into the development of industry agreed protocol regarding the coding of items in Building Information Models in line with a revised method of measurement. This should aid in the simplification of mechanical and electrical in line with a prescribed method of measurement which will add value for the client and encourage collaboration.

5.7 Conclusions

This study has examined the amendments to the PWC, in particular those requiring the measurement of mechanical and electrical services by the quantity surveyor in an attempt to evaluate the quantity surveyors ability to carry out such a role. The survey and interviews carried out and analysed provided an insight into the views of industry stakeholders including client representatives, contractors and the Government bodies.

The introduction of the bill of quantities in the PWC where designed by the employer is a move forward in many people eyes mainly due to the reduction in risk transfer. The move towards the introduction of the named specialist contractor is also seen as a step in the right direction, providing for quality. While some external commentators may be of the view that the amendments will drive costs upwards, it is the opinion of the OGP that this is a small cost to pay for more rigid cost certainty and overall better quality for long term assets. Many feel that the introduction of a bill of quantities will reduce the need to enter into prolonged and costly dispute resolution procedures.

The main barrier to the implementation of fully measured mechanical and electrical bills of quantities is the lack of technical knowledge of the quantity surveyor. This is a long existing failure on behalf of the profession with many academic commentators making reference to this fact over the last four decades. The colleges need to provide support to the upskilling of the professionals at both undergraduate and postgraduate levels. This means using all modern technologies in the delivery of programmes to facilitate the continued professional development of the profession.

Industry also needs to collaborate on the review of the ARM4 and Supplement 2 in order to produce a meaningful and useful method of measurement which works for all parties to the contract.

References

- Al-Hassan, M. R. (2006). An investigation into current cost estimating practice of specialist trade contractors. *Liverpool Built Environment & Natural Environment Conference*. Liverpool, John Moores University.
- Anderson, J. a. (2009). *Assignment and Thesis writing, 4th Ed*. Milton: John Wiley and Sons.
- ARM Joint Committee. (2009). *Agreed Rules of Measurement 4th Ed (ARM4)*. The Society of Chartered Surveyors Ireland and The Construction Industry Federation.
- Ashworth, A. &. (2000). *Added Value in Design and Construction*. Harlow, Essex: Longman.
- Ashworth, A. (2004). *Cost Studies of Building, 4th Ed*. Essex: Pearson Prentice Hall.
- Bandi, S. &. (2012). Exploring Issues on the Usage of the Bills of Quantities (BQ) and Identifying Relevant Research Area. *In Management in CONstruction Research Association Postgraduate Conference*. Kuala Lumpur: UTM Razak School of Engineering and Advanced Technology.
- Brinkmann, S. (2013). *Qualitative Interviewing*. Oxford: Oxford University Press.
- British Educational Research Association. (2010). Revised ethical guidelines for educational research. British Educational Research Association.
- Brook, M. (2008). *Estimating and Tendering for Construction Work, 4th Ed*. Butterworth-Heinmann.
- Bruce Shaw. (2008). *Bruce Shaw Hand Book 2008*. Bruce Shaw.
- Bruce Shaw. (2012). *Bruce Shaw Handbook 2012*. Bruce Shaw.
- Bruce Shaw. (2016). *Bruce Shaw Handbook 2016*. Bruce Shaw.
- Bryman, A. (2015). *Social reserach methods*. Oxford University Press.
- Cartledge, D. (2006). *New Aspects of Quantity Surveying Practice 2nd Edition*. Oxford: Butterworth-Heinemann.
- Chambers. (2015). *Chambers Concise Dictionary*. Edinburagh: Chambers Harrap Publishers Ltd.
- Clamp, H. C. (2007). *Which Contract? Choosing an Appropriate Building Contract 4th Ed*. London: RIBA Publishing.
- Clark, V. a. (2008). *The Mixed Methods Researcher*. London: Sage.
- Construction Procurement Policy Unit of the Office of Government Procurement. (2015). *Implementation of interim meaasures to amend the Public Works Contracts, as published in the Report on the Review of Performance of the Public Works Contract following engagement with industry stakeholders*. Office of Government Procurement.
- Corbin, J. a. (2008). *Basics of Qualitative Research, 3rd Ed*. London: Sage.
- Creswell, J. (2014). *Research design, qualitative, quantitative, and mixed methods approaches, 4th Ed*. SAGE, Thousand Oaks.
- Creswell, J. W. (2007). *Qualitative Inquiry and Research Design*. London: Sage.
- Crotty, M. (2005). *The foundations of social research: Meaning and perspective in the research process*. SAGE.
- Cunningham, T. (2012). *Does the Public Works Contract for Building WORks Designed by the Employer Achieve Value for Money?* Dublin: Arrow @ DIT.

- Cunningham, T. (2013). *Choosing an Appropriate Main Contract for Building Work in the Republic of Ireland - An Overview*. Dublin: Arrow @ DIT.
- Cunningham, T. (2014). *The Work and Skills Base of the Quantity Surveyor in Ireland - An Introduction*. AROOW @ DIT.
- Cunningham, T. (Nov: 2016). *Does The Public Works Contract for Building Works Designed by the Employer Achieve Value for Money?: An Appraisal*. Dublin Institute of Technology .
- Dada, J. O. (2012, April). Core skills requirement and competencies expected of quantity surveyors: perspectives from quantity surveyors, allied professionals and clients in Nigeria. *Construction Economics and Building*, pp. 78-90.
- Davies, R. (2006, March). The QS Transformation. *RICS Business*.
- Davis, P. R. (2009). Bills of Quantities: nemesis or nirvana? *Structural Survey* 27 (2), 99-108.
- Denscombe, M. (2002). *Ground Rules for Good Research*. Buckingham: Open University Press.
- Denscombe, M. (2008). *The Good Research Guide: for small scale social research projects, 3rd Ed*. Maidenhead: Open University Press.
- Department of Public Expenditure and Reform. (2013). Capital Works Management Frameworks Guidance Note: Public Works Contracts GN1.5. Department of Public Expenditure and Reform.
- Dept. of Finance. (2004). *Implementation and Administration of EU Structural and Cohesion Funds in Ireland*. Department of Finance.
- Dept. of Finance. (2011). *Value for Money and Policy Review of the Construction Procurement Reform Initiative*. Department of Finance.
- Egan, J. (1998). *"The Egan Report - Rethinking Construction."* report of the construction industry taskforce to the deputy prime minister. London.
- Fellows, R. a. (1997). *Research Methods of Construction*. London: Blackhall Science Ltd.
- Fogarty, H. (2009, February). Contractor perspective of the new Irish public works contracts. *Proceedings of the Institution of Civil Engineers. Management, Procurement and Law* 162, Issue MP 1, pp. 29-34.
- Government Contracts Committee for Construction. (2014). *Report on the Review of the Performance of the Public Works Contracts Interim Recommendations for amendments to the Public Works Contracts and Medium Term Strategy for development, procurement and administration of projects under the Exchequer Capital Pro.*
- Government of Ireland. (1997). *Strategic Review of the Construction Industry*.
- Gray, C. H. (1994). *The Successful management of design*. Centre for Strategic Studies, University of Reading.
- Gura, J. H. (1984). Role of the building services engineering consultant. *IEE Proceedings A - Physical Science, Measurement and Instrumentation, Management and Education - Reviews* 131 (6), 413-419.
- Hore, A. O. (2009). *Seely and Winfield's Building Quantities Explained, Irish Edition*. PALGRAVE MACMILLAN.
- Irish Statute Book. (2007, April 21). Building Control Act 2007. *Part 4*.
- Keane, D. (1997). *The RIAI Contracts - A Working Guide*. Dublin: Royal Institute of

- Architects of Ireland.
- Kehily, D. M. (2012). Leveraging Whole Life Cycle Costs when utilising Buidlin Information Modelling Technologies. *International Journal of 3-D Information Modelling*, Vol. 1, No. 4., pp. 40-49.
- Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*. New Age International.
- Kvale, S. (2007). *Doing Interviews, The SAGE Qualitative Research Kit*. SAGE Publications.
- Latham, M. (1994). *Constructing the Team: Final Report of the government / Industry Review of Procurement and Contractual Arrangements in the UK Construction Industry*. London: HMSO.
- Marshall, C. &. (1989). *Design qualitative research*. California: Sage.
- McAuley, B. G. (2015). Ensuring that the Needs of the End User are Effectively Communicated through BIM During the Building Design Stage. *2nd CITA BIM Gathering* (pp. 207-216). Dublin: CITA.
- McAuley, B. H. (2012). Implementing Building Information Modeling in Public Works Projects in Ireland. *Proceedings at the 9th European Conference on PProduct and Process Modelling*. Reykjavik.
- McCaffrey, J. (2010, May 27). What is an M&E QS. *Royal Institiue of Chartered Surveyors CPD Event - Construction and Sustainibility*. Moscow, Russia: Royal Institute of Chartered Surveyors.
- Muijs, D. (2011). *Doing Quantitative Research in Education with SPSS, 2nd Ed*. London: SAGE.
- Murray, G. P. (1997). *Measurment of Building Services*. Macmillan Press.
- Naoum, S. G. (2013). *Dissertation Research and Writing for Construction Students, 3rd Ed*. Oxon: Routledge.
- National Public Procurement Policy Unit. (2007). *Public Works Contracts Training Manual*. Dublin: Department of Finance.
- NEC. (2014). A Comparison of NEC and FIDIC . NEC.
- Office of Government Procurement. (2015). *Implementation of the Interim Measures to amend the Public Works Contracts*. Construction Procirment Policy Unit of the Office of Government Procurement.
- Office of Government Procurement. (2016). *Guidance Note 1.5 V2.0 22/01/2016, Public Works Contracts*.
- Pasquire, C. (1994). *Early incorporation of specialist design capability*. CIB REPORT.
- Potts, K. (2008). Change in the quantity surveying profession. In H. a. Smyth, *Collaborative Relationships in Construction* (pp. 42-44). Chichester, West Sussex: Wiley-Blackhall.
- Rashid, R. A. (2006). Bills of quantities - are they still useful and relevant today? *In Paper presented on the 21st -25th of June, 2006 at the international conference on construction industry*. Padang, Indonesia.
- Shuttleworth, M. (2008, March 17). *Research Hypothesis*. Retrieved from Explorable.com: <https://explorable.com/research-hypothesis>
- Smith, E. (2008). *Using Secondary Data in Education and Social Research*. Maidenhead: Open University Press.

- Society of Chartered Surveyors Ireland. (2012). *The Irish Construction Industry in 2012*. Society of Chartered Surveyors.
- Society of Chartered Surveyors Ireland. (2016, June 27). *Society of Chartered Surveyors Ireland*. Retrieved from www.scsi.ie: <https://www.scsi.ie/news/view?id=69>
- Stewart, D. W. (1993). *Secondary research: Information sources and methods* (Vol. 4), p. 37.
- Swaffield, L. M. (2000). *Improving Early Cost Advice for Mechanical and Electrical Services*. RICS.
- The Liaison Committee. (2006). *The Liaison Committee Code of Practise for Tendering and Contractual Matters*. The Liaison Committee.
- Thomas, R. (2001). *Construction Contract Claims*. Palgrave.
- Yusaf, G. A. (2012). Identification of the Potentials and Barriers of of Adopting Standard Method of Measurement for Mechanical and Electrical Services in Malaysia . *International Journal of Sustainable Development*.
- Rasmus, J, Birchall, S and Griffiths, P (2006) *Contract Practice for Surveyors 4th ed*, Butterworth Heinmann, London.

Appendix A: CIF Survey

Confidential Straw Poll Survey

I primarily operate in the following sector:

Mechanical



Electrical



Both Mechanical and Electrical



When pricing work we typically use the following as our primary reference document:

Bill of Quantities



Drawings



Performance Specification



Other (please indicate)

Appendix B: Interview Transcripts

Interviewee: DAVID O'BRIEN

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

DOB; Yes or else this would not have been undertaken. The situation to date is that the bargain struck in 2007 when the contracts were published was that the contractor would price a comprehensively designed project and provide a lump sum fee taking into account the risk associated with the project. What we found was, in many cases, the level and standard of documentation which was expected to improve actually worsened. The reasons for this were set out in the report and were mainly due to the competitive fee environment which extends in to the works situation. In a way we had the perfect storm where the works not better defined than they were under the previous remeasured forms and the contractor had no alternative but to claim. This forced parties into third party dispute resolution procedures. As a result we were getting a huge uncertainty of risk and unsatisfactory situation where contracts were being delivered for less than 3-4 years ago. The change in status of the bill was a choice of the employer and was change under schedule K of the contract.

CM: Was Schedule K being use as a "gate out of jail" card to allow transfer of risk which permitted consultants to provide a lower grade of tender documentation?

DOB: In some cases it was possible but it's not the sole reason for the change. Our core thing is to be able to identify errors and address them as compensation events without going to dispute. We were only becoming away of the issues after the conciliation and this had sucked resources out of the project to deal with the conciliation and the contractor had done the same. We do not believe this to be in the best interest of project delivery. This is a key part of trying to ensure a more efficient delivery.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

I suppose that there are two aspects to this. 1) The quantity surveyor took all the design information excluding the M&E and put together a documents which spelt out the cost of the project. As part of that process they are uniquely positioned to understand what parts of the information are missing, so that the logical extension is that we want to bring that person back into a key role. It's kind of like a cataloguing or librarian role if you like where we say that this information is missing. If we know that this information is missing and the designer is responsible for this then it's back to the designer. It's this concept of interrogation. The contractors are employing legions of quantity surveyors to compile their claims so why would we not have the benefit of that expertise before we enter into a contract or into procurement.

CM: The M&E Specialist understand the level of interrogation but is that level of interrogation available to most PQS firms?

DOB: No and we are well aware of that. And we have asked industry to talk to us about this and industry in this case being the quantity surveyors. There are many M&E consultants who do that along this journey who do prepare BOQ and we need to clarify how this is set out in the terms of service. It needs to be set out who is responsible for providing this services in such cases. Going back to my days in private practice as an architect we were never quite sure what was going on in the M&E side. There were often unpleasant surprises. An experienced client gets that but an inexperienced client is often surprised and questions what is happening. So, I fundamentally think and understand that it's a technical aspect of the works and mixed with the public procurement aspect where the builder decides on the product it's difficult.

CM: The new requirements coupled with the procurement procedures may lead to the M&E element of the BOQ being quite a wordy document.

DOB: Exactly, it's very difficult. The interim position is using ARM4 Supplement 2 which is pretty basic but at least it's standard. So if people can hit that in the interim. We would like one person to be reporting all costs.

CM: Has any negativity been experienced in relation to this measure?

DOB: There were tensions but not real negativity. We met with SCSI and the Engineers. Some services consultant said that they carried out the function but agreed that it was not the norm within their profession.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

- C) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?**

DOB: This could return to the current status of lump sum. If the M&E package can not be accurately designed then they might revert but we prefer to see it measured and remember the journey that we are on with BIM. I don't believe it will negate the need to measure. There may be some areas in very innovative situations. 15% of the the over all contract would be the guiding rule in this situation but not all mechanical systems should be brought together to compile this figure. This also allows where the best are provided as part of the prequalification and an alternative possibly lesser contractor provided at construction stage. The direct tendering in this instance can help to ensure quality. Prudent public sector clients have already moved over to this system and were looking at implementing the interim measures before the ink was dry on the report.

D) Will this aid in providing cost certainty for the Client at an early stage of the project?

We have spoken to Public Sector clients and explained that we would see increases in tender prices but expected better quality of output. This is what we were about initially and there was not any push back. They deal with the macro level in terms of the budget and obviously the inference being that we would be delivering less projects for the same budget but we have to look at long term product, we are not speculative developers, we are trying to produce a building which will last. It's an asset management role. We are trying to move towards the true economic life and the national procurement strategy is moving towards the life cycle costing aspect and we are going to be moving into this.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

C) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

We are always criticised in the public sector for not putting deadline in place. We put that in to challenge but the realistic situation will determine when that happens. The prudent client is looking at that in their pre-qualifications. As a result the supplement 2 will prevail but it's heartening to hear that a number of firms have invested in that.

CM: Education on undergraduate degrees in relation to M&E quantity surveying is quite limited and generally equates to a very small aspect of the courses with resources being the main reason for not providing more training.

DOB: Do you know what I see happening from our end? If we push it, and this will take a bit of time, the private sector will latch on and the demand will drive the need for more of these courses.

D) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

Well, I will defer that to our QS colleagues on the GCCC. We have endorsed the Supplement 2 and published an article on this on its publication. We are happy with it but there are some clients who will want the full measure as per the ARM4 such as the new Children's' Hospital. I also believe that Trinity are doing it as well and UCD will do so also. These clients are looking for more "bang for their buck"

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

DOB: Even though I have said that M&E consultants have said that they prepare BOQ for some works it is just that, for some jobs. The Office of public works(OPW)have a substantial M&E section and prepare their own bills of quantities but not necessarily to ARM or supplement 2 and have made calls to the ARM committee to liaise in this regard. The M&E consultants will largely rely on drawings and specification. The OPW were not happy with Supplement 2. The CIF and SCSi form the ARM committee.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

DOB: Yeah, it is. Undoubtedly it is going to be challenging. I was never quite sure of how payments to M&E contractors came about. At time there was a clear breakdown but not often. Public buildings, under certification and over certification an even bigger problem. And now we have the construction contracts act, suspensions. There is just no way of avoiding it. You need to set out justification of payments and this has to be set out on some piece of paper or document or menu of prices along with a site inspection. If we are changing to this system it will be challenging and there are so many things pointing in this direction that we have to head there. I feel that this will be of help to the contractor in the same way as the measured BoQ as it offers certainty. I am not knocking designers as I am one. The bill should always have been in place as a risk item as it would have driven the design at the initial stages.

Interviewee: PAUL DUNNE

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

PD: Yeah, I do. I think the whole underline ethos of mitigating risk is a good one because while we do mitigate risk here in DCC I know that other employers just pass the risk directly to the contractor. There appears to be a tendency with some employers to dump risk. I believe that the return of the BOQ returning as the primary pricing document is a good move. We have had an event whereby an item which was omitted from the works requirement but covered in the bill was effectively omitted from the contract. At least now I believe the aspiration is that in the instance of future disputes we will be returned to looking at the BOQ. "What's in the Bill?"

The current status is that the drawings were the primary source of inclusion irrespective of the existence of bill. Now we will be able to value variations or additional works in a simpler manner. The priced schedule became a schedule of rates.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

PD: It was felt that the services engineers' expertise was in design not in cost control, budgeting etc. Most of the design seemed to be carried out by the specialist contractor. They seem to want to manage the works. The fees over the last number of years seemed to reflect this. Cost management of M&E seems to have been paid lip service. Instances have arisen as a result whereby two months from the end of a project that a large increase in the M&E packages arrives certified by the consultant rather than the Employer's Representative. They seemed more interested in the design. It's no big deal for the Qs as they have been carrying out the role unofficially. M&E is more complicated but it's just an extension of the role.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

E) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

PD: If we have to measure the M&E on a big project we have to measure it irrespective of for a full bill or for a novated specialist. The difficulty is where the design is in its infancy in the novated situation rather than for the contractors' bill at the back end of the design.

We have used the reserve specialist mechanism for the small refurbishment of the lobby of our own building. It worked on the ad hoc mechanism we used. The other thing to remember is that if you are novating you are into the whole procurement issue but by letting the contractor procure the package domestically you can reduce the time. So it was intended to only use this measure in very specialist areas.

F) Will this aid in providing cost certainty for the Client at an early stage of the project?

PD: I think it has to. 1) If you novate a tender amount of €300k across then you have certainty of that and in 3 month's time you won't get a tender in for €500k. This is better than the "M&E" kick where you receive a huge increase in the value of the M&E a couple of cost reports from the end and the clients asks "why did you not know?" If the QS is doing the payment for the sub-contractors he is looking at the pricing document.

The Civil, structural and services consultants are not always involved at the very early stages of the design and only seemed to get involved when the Architect is a minimum of 20-25% of the way through the design. This may change with the introduction of BIM at the design stage.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

E) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

PD: I think the 18 months is a sufficient time to upskill for a measurement basis. I believe the technology and the ability to interrogation of the design is the challenge. Once a QS has a few jobs under their belt they should start to develop an understanding. I believe that the introduction of BIM and the ability to interrogate on a 4th and 5th dimensional basis. The measurement is the easy part. It's the integration of

the systems where the challenge exists. The systems may be mind boggling but if you understand them then the measurement is easy. If the smaller firms do not have the time to upskill then they can farm it out. We are currently putting our QS framework together and we do not expect those selected to have all of the skills in house but they must have access to them.

F) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

PD: I'm not convinced on the simpler builds, such as houses, then Supplement 2 will suffice. However, I think that Supplement 2 may not be totally relevant to the mechanism in which the industry price the works. We have recently received the bracketed approach to pricing. But have always sought to have a breakdown provided just not necessarily in line with a standard method of measurement. It's very QS orientated presently. ARM itself needs to be addressed at this stage.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

PD: I think that most of them find the BOQ too time consuming and are happier with the performance specification. I also believe that they do not have the expertise to examine and to manage the pricing of the BOQ. In relation to the issue of the trusting the BoQ the new measures should help them to trust the bill better as they are remeasurable and so variations can be reclaimed.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

PD: I think if the Qs is responsible for the design cost management then we need to make the bill more industry orientated so that it becomes more relevant in cost planning, variations, dispute resolution. The contractors price on a bracketed basis and if he is successful he goes to a specialist who prices the breakdown on the basis that he is going to get the job. We are being told that not every item is going to be priced as it is not practical. IF a QS is to get into that space then we need the cost database and we cannot get that without the tender breakdown. I would like to think that over the coming time that there will be a coming together of the Mech and Elec side in industry and SCSI / ARM committee to modify the documents into something which both sides can use. You can still have an amount of lump sums as

long as they are the right lump sums. We may not be too far away from having a more user friendly and marketable method of measurement for services.

Interviewee: SEAN DOWNEY SD

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

SD. This could potentially lead to better project and contract risk management. It needs to reflect where we are and the contractual set up must acknowledge the fact that buildings are not designed before commencement on site. There needs to be acceptance that a rigid, transparent and fair change order management procedure should be in place to facilitate change and allow for cost monitoring, forecasting and control at a macro project level.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

SD: The current situation does not appear to work effectively as there seems to be an approach that is long enshrined in the use of RIAI/GDLA forms of contract; i.e. roll it up and have a bun fight at the end at final account stage. The new regime if it delivers on its potential should allow for the competent “cost controller” to fulfil his obligations with the technical support of the rest of the project team.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

G) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

H) Will this aid in providing cost certainty for the Client at an early stage of the project?

SD: No. they are separate issues. One deals with the procurement route which sets out the performance requirements and establishes what has been identified as the works requirements at tender stage, the other provides a mechanism for benchmarking against that data set and allowing for the re-measurement based on either changes to scope or changes to project/works requirements, (including a realisation that the original information was perhaps deficient).

In relation to the second part .Yes, somewhat. The client will get cost certainty on the basis of the information that has been prepared up to that point.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

G) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

SD: No. I believe that it is short but none the less still a timeframe. The industry sometimes needs to be given tight schedules to drive change otherwise apathy sets in and people think that the change is not really going to happen. I understand that third level institutions have already rapidly responded to the new skillsets required.

H) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

SD: It could be preferable if we had a full database of elements that were set out for pricing purposes in the Bill of Quantities.

My concern would be that we will end up with a version of Supplement 2 that includes Parts of M&N were it suits the consultant to do that as they have a niche in-house expertise that allows them to go deep in certain elements of the BoQ.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

SD: Heretofore M&E Bills of Quantities did not exist, save for in exceptional circumstances where certain public sector agencies with responsibility for significant building fabric maintenance and management portfolios may have employed them at tender stage.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

SD: If the information is real and relates to the proposed works requirements then it can only be of benefit to all parties in the longer term. I would be concerned that for projects being tendered in 2016 and early 2017 under the new rules, the BOQ will contain endless lists of lump sum items for entire systems and would not see that even a medium term benefit to anyone.

Interviewee: Alan Duffy

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

AD: I believe it will. I believe the previous system was unworkable and that the building services played such a critical part, not just in the construction stage but in the life cycle. The client needs to have a more direct involvement and the risk needs to be more evenly proportioned.

CM: What about the move away from the lump sum arrangement?

AD: It puts more onus on the design team members to be more definitive on the scope. It's a better thing. The whole idea of the BOQ is that rates exist to allow a change to be priced. The contractors for their part need to realise the significance of the bill and the enormity of pricing the bill correctly. The client also has the visibility of the rate and it allows for good cost reporting but it does move away from pure cost certainty. Rates are also going up and people are starting to price all items. We have seen this over the last few months. This is happening in conjunction with other changes within the industry such as BIM and it will filter into the smaller projects. This will ultimately allow the BOQ to become a much more user friendly document.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

AD: Well I think that there are a number of driving forces. We, the QS, we would advocate our own specialism and qualifications and profession being cost management. There is also an amount of lobbying that has taken place from that side. Also, on the client side there is a legacy of projects having cost overrun whether it was from cost plan through to tender or at post contract. Maybe, and rightly so, the building services elements have not had the same degree of cost control applied to them as some of the other elements from the QS perspective. The client is calling the tune and is saying that there has not been proper cost control. From the designers point it may have been difficult to wear both hats. I think that we got to where we got and technology improved over a generation. Costs increase as well and we, the QS, may take a bit of time to catch up.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

- I) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?**

AD: It's always going to be the direct tendering of the specialist due value or critical importance. I don't think it will negate the need. There will be a need for a change of culture and it will take time for this to occur. The BOQ serves a function and serves it well as part of the cost control function generally and should work the same for the M&E elements of the project. There is room for improvement in the ARM which will be of benefit at a later stage. It makes sense on employer designed projects.

- J) Will this aid in providing cost certainty for the Client at an early stage of the project?**

AD: Yes, I think it will. The phasing of the procurement will probably see the specialist tendered first. As long as there is a concrete scope of works.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

- I) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?**

AD: I don't know about the 18 months. If you are talking about training a QS as an M&E QS. You won't be able to bring him from "zero to hero", in that time. There will be a number of sub consultants. They will need to be brought up to speed by industry and / or templates being provided by the likes of the OGP. The bulk of smaller to medium size practices will be doing repetitive works where templates may be available from the OGP or SCSi.

- J) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.**

AD: Supplement 2 is good but has limited measure. If supplement 2 had gone further in asking users to take off quantities it would have been better. I would go with Sections M&N from the off.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

AD: The problem is that our construction industry is comprised of many small and medium sized guys who generally don't see bill as they are pricing jobs which do not require them. The bigger guys will price bills. As the works value increases then we will see more BOQ. The example is the hospitals versus a school extension. Also the reduced capital spend during the last 8-10 years over the recession was probably a contributory factor.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

AD: Well yeah. There is an onus on those preparing the bills that they only place real information within the bill. For the vast majority of items it is a legitimate request on behalf of the client, its fair. The contractor has no valid reason for not populating it out as these are the items which the client may need more of. We will see confidence at client level. It is important that we have it priced to the level that the client requires. There is a slight licence with the QS to adjust what is needed in how the bill is priced out and the ARM does allow for deviation where necessary. It also has to come down to the ability of the surveyor to interrogate the design in order to have a valid BQ.

Interviewee: Owen Hearty (OH)

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

OH: Yeah, I have looked at this and believe that its two fold. It adds more responsibility to the design team in making sure that the tender information is complete and it adds more value to mechanical and electrical because it's measured and it's under the control of pricing document. But there is an element of risk to that as well and the tender documents should be adequately designed. It should also be of benefit to the main contractors. A bit issue recently has been that consultants have not been measuring in line with ARM either as there was no requirement when the works requirement documents took precedence.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

OH: I think one of the key issues is transparency and having the quantity of the work specified when the QS has it measured in the pricing documents it helps with assessment of the change orders and the client is aware of their exposure from the cost point of view. That's where we would see the fundamental reason for the change.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

K) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

OH: No I don't. I believe we should continue to try to measure all elements of the works. There will be some which are very difficult to measure but in relation to mech & elec I believe that we should continue to try to measure these and have them itemised where they cannot be readily measured.

L) Will this aid in providing cost certainty for the Client at an early stage of the project?

OH: Well when we look at, possibly contradicting myself, but the fact that the PQS will be involved with that element of works in the early stages. The PQS can go to the market and get likely costs prior to full measurement and can take account on lead in periods and take items such as Brexit into account.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

K) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

OH: The timeframe is tight. Traditional PQS firms who measure bill of quantities in accordance with ARM 4 will adapt to using the supplement 2. Where there is an issue is whether there are enough qualified mechanical & electrical quantity surveyors who are able to measure in accordance with sections M&N. This is a skilled version of the quantity surveyor. M&E is not a major topic in the academic courses and this is a stumbling point. There are few courses which offer sufficient training and this leads to the question if the QS will be deemed competent to measure M&E in the event of a claim. The detail of M&E services on drawings is more difficult to understand than that of say structural drawings. There is also a lack of communication within the design team which may hinder the upskilling.

L) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

OH: My opinion initially is to use sections M&N to do it. The ARM 4 supplement is very straight forward. I still think it leaves us in the position we are currently in. It does not allow for a schedule of rates or for much measurement. The measurement is very itemised and does not allow for collection of data for cost data bases and it doesn't allow for cost data for us in life cycle costing. I feel that when using the supplement it might be a prudent idea to include a schedule of rates for M&E items which would allow for the valuation of change orders and for the compilation of a rates database. Section M&N are the way to go initially. The key may be to expand the supplement as part of the reform of M&E measurement.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

OH: Ok, I suppose the QS would not have been in control of the M&E packages and that these packages would have been tendered directly by the consultants. This facilitated the return of lump sum contract. It was never part of the standard forms of contract that it had to be measured and it was a tradition in the industry to price on drawings and specification.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

OH: I think it is going to cause issues. The other side needs to understand what they are getting and the PQS needs to be competent in understanding what they are putting into each line item. I do think it's the correct way to do it, having it all itemised, as it brings it back down to agreed rules of measurement but it has to be done properly and the other side need to understand what is being described. Both parties need to use ARM correctly.

Interviewee: Andrew Nugent

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

AN: I do yeah. I agree that it is the way forward and rebalances the risk etc. But my fear is that we have not gone far enough but it's a positive move. It's critical in today's market where activity in the private sector has been rekindled and is starting to grow. We are in the position of 6 or 7 years ago during the collapse where the public sector was the only show in town and where the public sector sought to dictate the market. I've always been of the opinion that the pendulum swung too far back with the initial draft of the public works contract. That the risk was transferred, too much risk was transferred to the contractor which created a litigious environment. It does not achieve its goal of attaining price certainty.

CM: You mention that the interim measures do not go far enough. Can you elaborate?

AN: I think there are various issues but one is that I believe it is too easy to refer issues to conciliation or other ADR mechanisms. As a result there are too many contracts in dispute resolution which is of detriment to the contracts. The intention of public works contracts in driving the design earlier was a positive move but it didn't happen on many projects.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

AN: I think it's positive heretofore for the public works contract your typical QS was only involve of 65-75% of the value of the project. So having the QS responsible for 100% of the costs is a positive move as is the stipulation to use the standard method of measurement. I think it is to be welcomed. The intent of having these elements measured as per the standard form will take time. But I think we need to standardise both measurement and production. We as a profession have been seeking this for the best part of 30 years even though it means additional responsibility.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

M) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

AN: No. The intention would be to measure. There is no reason why it should not be designed and measured as per measure 1. It does give some flexibility in the case of more complex systems but there is scope for misunderstanding of procurement at present.

N) Will this aid in providing cost certainty for the Client at an early stage of the project?

AN: It will assist and help with the management. It is similar to a twin track approach to tendering. It will be a more cost effective mechanism of tendering.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

M) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

AN: I think it will take longer but it's a reasonable time frame for allowing for surveyors to focus. But the full bedding in will take time. It will start with colleges providing more training in this regard. Everyone is tight regarding resources. We would need to liaise with the colleges to see the extent of mechanical and electrical measurement.

N) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

AN: I will kick to touch on that one. One of my colleagues in the office may be better placed to answer that one.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

AN: That was the recognised format and the norm. Effectively the QS had not captured control of the cost control of this element of the work but the interim measures are now bringing us in that direction. The engineers were reluctant to let it go and especially on a fee basis but we're in a new world. The systems are more complex even in the domestic situation. But still I am very positive about it because we are trained to break that down. The ARM maps that out for us as well.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

AN: They will eventually but we will have to go through that learning curve with them. Post tender they do. We will be better equipped to seek that breakdown and will know better what breakdown is required once we go through that training. That's why the education side is do important and we will eventually produce better M&E elements of the bills of quantities and be better equipped to ask for the break downs etc. It's no different than builders not breaking down the preliminaries sections of the bill and us seeking breakdowns. We get then eventually.

CM: Would a review of work sections M&N aid here?

AN: It is yes. It has to be looked at. The emphasis will change and focus on M&E. It will develop into a specialist area but we all need to have an overview of it. I'm confident that this is how it will happen.

Interviewee: David Byrne

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

DB: I don't believe it will add value for the client. The quantities now form part of the contract and are remeasurable so if the PQS misses an item then they will leave the client open for any variation. With the current format the contractor must price the risk and is held to the content of the drawings and specification. The client received costs certainty albeit with quality issues in certain instances.

CM: What about the cost of disputes which are not mentioned in the reported construction costs?

DB: I still don't believe that contractors would start pricing in the risk, well some might, I don't know. But those disputes costs added in may show a different picture. A risk should go in as a costed item, if risk is reduced then the cost is adjusted accordingly. I don't see how moving from a lump sum to a remeasurable contract will add value. Maybe in relation to quality but not on a commercial value.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

DB: I think that the PQS is better placed to prepare the BOQ more so than the design engineers. It's part of the PQS role and they are better suited in a similar manner to the way the consultant is better suited to the design. The number of the consultants who can prepare a BOQ is minimal and while the PQS may not have the technical knowledge presently, they are the best suit to prepare budgets and reports.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

O) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

DB: No, it will develop the requirement. You will have to have the same form of procurement across the board. I believe it will drive it rather than negate it.

P) Will this aid in providing cost certainty for the Client at an early stage of the project?

DB: Competent BOQ will give cost certainty. Gaps in the Bill will cause issues. The detail of the content is paramount. There needs to be consistency with the changes to the design and the bill. The PQS needs to make the designer their friend.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

O) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

DB: Sufficient timescale 18 or 24 months?? Yes it is. It depends on how much they wish to commit to being an M&E Qs. If they commit its fine. If they dip their toes then no. Some of the smaller guys are terrified. They feel the fee will not represent the workload and feel that it is more than a burden and I have found some to be quite negative about the “black art” of M&E surveying. They are scared of the technology and the software. Most of the senior PQS I know in the industry are from contracting backgrounds and have upskilled through CPD and further education.

P) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

DB: The main difference is liner items. The breakdown of the systems are different. Supplement 2 will be beneficial and when the ARM5 arrives it will adjust sections M&N.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

DB: The main difference is that the PQS has no requirement to put the M&E bill together. This bill takes more time and resources to put together. Many feel that they won't get paid the correct fee on it. So if you are not going to get paid then why should you do it? In private work, which is plentiful at the moment, there is no need for M&E bills so why put yourself to the expense and hassle.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

DB: It is practical. It bodes well for when the design is not complete and variations can be adjusted.

CM: Does work section M&N break it down too much for the industry?

DB: Specialist suppliers may not break down in line with the bill. They may only look at the drawings and specifications and ignore the bill and the ARM. So it may be necessary to bracket certain areas in these instances.

Interviewee: Gerard Ryan (GR)

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

GR: Yes, with a bill of quantities you know exactly what you are pricing whereas with a works requirement specification can lead to ambiguity. It's better for the contractor as well because the bill of quantities is clear cut. The client also needs to look at the chances of dispute due to poor documents and how the reintroduction of the bill should help to reduce this.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

GR: I suppose, maybe, the qs knows what a qs does but the services engineer is best at dealing with design.

CM: Is it fair to say that the Quantity surveying role is more analytical and based around cost control?

GR: It is. The design engineer is looking at what goes into the building and working on very broad range costs. We are never asked for very detailed breakdowns by engineers, whereas a quantity surveyor seeks more detail. The QS is also better able in relation to procurement, cost control and reporting.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

Q) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

GR: I suppose if you bring a subcontractor in at the beginning of the contract you can get a better design. In relation to the measurement it may help with payment and valuations.

R) Will this aid in providing cost certainty for the Client at an early stage of the project?

GR: Definitely gives cost certainty.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

Q) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

GR: That's a hard one. Probably not. There is a lot to learn between the two. Electrical is probably a lot easier. Unless you are full time at it but it hard to know. If I were qualified as a plumber I would know what is missing when I look at a drawing similar to a QS looking at a cavity wall and knowing that a dpc is required.

R) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

GR: I am not too familiar with the supplement but looking at it here the systems listed seem pretty ok but the manner in which you are expected to measure is quite limited. In relation to the sections M&N there are instances where there can never be too much measurement. If the installation is simplistic then the supplement should be sufficient.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

GR: I don't remember even in my PQS days even seeing a services BOQ let alone preparing one. And in my time as a services contractor I received tenders on the basis of drawings and specifications from the client and sent out similar packages to our sub-contractors. It's just the ways it's happened. I think the PQS has been scared to prepare the BOQ because of the technology element.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

GR: It is practical as it safeguards the contractor as he is using the BOQ. It also lets the client see what is priced and to develop confidence in the contractor on that basis. All we need is the contractor to have confidence in the bill as produced. The main thing is that it a bit of a change for everybody involved.

Interviewee: Brian Travers (BT)

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

BT: I do believe that it will add value for the client in that there is less scope for VOs but it's also dependant on the accuracy of the bill. In theory it's the right way to go. It depends on the competency of the QS. Lack of clarity can have an impact on programme and if the bill is not accurate it can lead to delays while awaiting clarification. My worry is that with human nature, when the bill is being measured there will be over-measure. 9 times out of 10 the QS will be measuring projects which have yet to be fully designed. We have had recent experience on this basis. The contractor will need to be aware that the project quantities may not be what is within the bill.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

BT: Its cost certainty for the client. Being able to see a true budget earlier in the design process. Previously it was provisional prices without a true budgetary breakdown. Assuming that the QS is competent in the measurement of services then it's the best way to go. It's good for the contractor too as the measure is complete and they need only price the BOQ. Any M&E contractor receiving a Bill will always check the quantities. A couple of years down the line there may be more trust between the parties. It is the best way moving forward, to have a measured bill in line with the ARM.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

S) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

BT: No, I think that still applies. It can only serve to help.

T) Will this aid in providing cost certainty for the Client at an early stage of the project?

BT: It can only benefit in this regard. There will be more cost certainty with this mechanism. Design certainty is also required.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

S) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

BT: I think 18 months is a bit short and that 24 months is a better timeframe. A lot of PQS practices are hiring staff from the M&E contractors and training them as QS but this takes time. It's still quicker than trying to train PQS into an M&E QS function. I think the 18 month period would only allow you to master one of the two (M&E). As regards resources I believe that more third level courses are available at present in colleges such as DIT. There is a noticeable shift towards upskilling staff currently within the M&E contractors presently.

T) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

BT: In the interim I believe that we should use section M&N as I don't believe the supplement is of much use. It may be of more use within more simplistic projects such as housing. I don't believe that sections M&N are too detailed as we are using them in a project currently and they seem to work fine. I have not looked at the previous editions of the ARM or really looked at the sub classifications within at this time.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

BT: That's surprising. I didn't expect it to be that low. The lack of expertise of the QS, which has been acknowledged, would appear to be the big thing. As a result the drawings and specifications approach may have been the better or easier approach at tender stage with some form of broad form of tender.

The bigger projects would generally have bills of contracts but private projects would not normally have a bill of quantities for the mechanical and electrical elements.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

BT: I think you have got to have a break down. How else can you price for a variation. With the bill of quantities you would be concerned as to how used to pricing a BOQ the contractors are, especially when you consider the results of the earlier poll. It looks easier than it actually is. I refer again to the competency of the quantity surveyor measuring and producing the bill.

Interviewee: David Hughes

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

DH: I've come from a market in the Middle East where the BOQ is quite prevalent whereas markets such as the UK have moved towards generic pricing documents. There are pros and cons to both. I find that having a detailed bill I think it adds a lot of clarity to both parties. Traditionally, when I worked here in 2008, we did a lot of pricing documents. They were fairly high level and got the elemental costs so there were bundles of money which could be interrogated. A further level of interrogation could take place with the subsequent return of priced schedules of rates. By the client's QS issuing a detailed BOQ, provided the information is to the required standard, it should provide a lot more benefit to both parties in relation to reducing risk. The level of design in Ireland from MEP designs would not have been as complete as in the UK and Middle East. There has been an element from the designer to get the contractor to aid with the design. I think the new requirement for billing will put the QS in a watchdog role over the M&E designer. I think this gives the client more certainty of what he is getting. But on the other hand the lack of certainty from the client about what they want is another issue.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

DH: I think it's purely intuitive. You want one point of control for cost. With two points you have second possible point of failure. Assumptions made by one party are carried out by another party. Within a quantity surveying practise it's different. Surveyors doing different functions on the same project are more in tune. The example here is my own MEP team who do a gap analysis with, say, the civils team to ensure that nothing has been missed or taken for twice. We see who has taken ownership internally and everyone knows who is responsible. This facilitates the gap analysis. It's difficult to coordinate in this manner with engineers whose primary function is to design. What we are finding with engineering firms is that its 70:40, they don't want to bill the job. They can put together pricing schedules. It not that they can't do it. Anyone can be trained up relatively quickly. They don't want to as they make their money on the design. I previously worked with a multidisciplinary group and the last thing they wanted to do was measure, count or even price. If they wanted costs they rang a supplier or contractor. But we, the QS, monitor costs and derive costs on a per m or sq.m basis or per KVA or per watt. We can tell a client at a very early stage what his cost driver is for his lighting system or his

UPS without calling a supplier because we have taken that data and analysed it from historical data. So cost management is what we do, it's our DNA and we're better at it. Similarly, we are not designers. We can comment on design perimeters and benchmark it, but we are not designers. I used to be a designer but jumped ship and retrained when I saw what surveyors were being paid.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

U) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

DH: I think you can do either or. I personally favour the current method. It's very easy to evaluate like for like. Things like front loading. The cost manager still has to interrogate the tenders for front loading and other anomalies. With lumps of money it's very hard to do that. Personally, I do favour the billing as we have to measure it anyway for cost planning. We don't see it as a huge extra over. We're not working off excel anymore. We have platforms that you can just press a button and it goes from landscape to portrait. All the subtotals add once you have the right drop down descriptions and it's not as onerous as it used to be. The most important thing for us is the data. The clarity for variations is a prerequisite.

V) Will this aid in providing cost certainty for the Client at an early stage of the project?

DH: We have discussed this earlier. Can we move on?

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

U) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

DH: You're kind of asking the wrong question. The contractors are asking the engineers and the engineers are asking us. The industry is either upskilling or it's not. They're outsourcing it even if its supplement 2. I, personally, believe it should just be mandated. And I've the same view on BIM. Just mandate it and move forward. We as the client representative want the contractor to be able to price the document. We feel that preambles directing towards the method of measurement or the specification should make things clear and where they do not we will look to provide clarity elsewhere within the preamble. I think because of this we are evolving.

V) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

DH: I think sections M&N. I believe the supplement to be pointless as I mentioned earlier. You are not adding anything by using supplement 2.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

DH: I'm trying to think when we did an MEP BOQ in Ireland prior to 2008. It was more a quantified schedule of rates. It would have been very rare. However, in the Middles East it was a standard practice but the contractor took ownership of the quantities. This lead to a bit more analysis. In relation to the Irish market, it was historically procured through the engineers and the engineers know their design and their specs and that what they wanted you to price it on.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

DH: I think that there is no issue with that. If they don't price every line item it really de-risks them if they price every line item. In areas where they take a view where they are waiting for suppliers to come back to them, they will take a punt on areas of small money, the can pro-rata it. When we do amend or tweak the method of measurement, for example, where we measure ductwork it's usually done in sq.m and its €80 per sq.m and if it's insulated its €20 per sq.m and if its fire rated then its €10 per sq.m. Every man and dog knows roughly where that is. It is a huge bulk of money. There is no benefit in scheduling it out in a different format, only for us to work out what the surface area is so that we can bench mark it against other prices. Things like ductwork. Also thinks like small bore pipework where we must measure this valve. For larger bore and specialist sets, bends etc., then yes. The fact that we can get a BIM model to spit it out does not mean that it adds value. There are certain elements where the method of measurement is irrelevant, maybe irrelevant is not the word, pedantic!! Using the contractor's BOQ that he has subsequently issued during the negotiations and based on the lump sum we know how they measure it and how they price it. To issue them something that doesn't follow how they price it within the industry does not make sense. The pricing document needs to align with the industry, not the other way around. So if you go into too much detail, you know. It's like the age old issue with the BMS. If the supplier won't give the information to the contractor then you're not going to get it no matter what's in your BOQ.

Interviewee: Niall Bourke

Question 1

Interim Measure 1 seeks to reduce the level of risk borne by contractors working under the Public Works Contracts by reinstating the Bill of Quantities as the primary pricing document in place of the Works Requirement Document.

Do you believe that this will aid in the delivery of projects in the Public Sector and add value for the client?

NB: On a services side, no, I don't. I don't believe it will add value to the client. The reason for that is that the mechanical and electrical people are used to pricing off drawings and used to providing basically a fixed price provided the design does not change. Therefore they are used to getting a lump sum price based on a good design, whether there is a bill of quantities and the design is fully complete in the first place. The same problems occur whether it's a bill of quantities or the take-off from an M&E contractor if the design is not correct. You don't have contractors who are deliberately setting out to look for claims so the boq will allow the client to controls a claims orientated contract in a better manner. My personal view, while surveyors may have a different view, is that the M&E industry is not claims driven. They are only claims driven against designs that are not fully completed. That is my view. I'm going to qualify what I said from an Office of Public Works point of view. They still have not got a situation where they're dealing with the M&E contractors. They are still dealing with the main contractor through the M&E team. In that manner, through the claims orientation of the main contractors, the bill of quantities will provide the client with a better control of costs on the M&E. That's not giving them any better a job that the M&E guy was giving them in the first place. Its giving them the ability to control what some main contractors are fleecing them on and which the M&E contractor's don't get anyway. To finish the point, if the bills are done wrong on a good design they are wide open. If there was no bill done and you were dealing with M&E people then they're not wide open. They have provided themselves with a possible mechanism of controlling excessive claims which are being generated by builders. But they have left themselves wide open to quantity surveyors not being able to bill correctly. I will give you an example of something I have priced whereby one line item in a bill would say "pumps complete with valves" which is a very hard thing to price but basically it's saying that it includes the isolating valves included within the drawing. But the next item would say boilers, chlorifiers but doesn't mention valves. It may mention connections but my definition of the connection is a flanged or screwed connection. Then when you look at the drawing it shows a note stating the boiler is to incorporate the boiler plus flanges and two port valves to shut down heat through the boiler. I know the argument is that the drawings show what the installation should be and my answer is that the description says this. When I'm pricing the job and what has to go in there I won't get it.

Question 2:

Interim Measure 1 also seeks to have all aspects of construction projects, including mechanical and electrical packages, measured under a standard form of measurement such as the Agreed Rules of Measurement 4th Edition (ARM4) by a competent construction cost professional (such as the Quantity Surveyor). The procurement of specialist mechanical and electrical services has previously been the function of the Services Engineer.

What do you believe to be the rationale behind such a fundamental change?

NB: My opinion of that change, which is still the change to the bill of quantities, is that the contract before the changes that the contract itself was broadly unfair. I have my opinion as to whether it were legal. There are clauses in the contract which directed all the risk to the contractor. Because the government only wants one point of contact with the main contractor and they are adamant that they don't want to go back to paying subcontractors separately that bill, therefore, follows through on the project and has included the M&E elements of the work. Now, not talking about the main contract but talking about the M&E services, it's now come into M&E services because of main contract issues which I think. To be fair to the builders, the contract was grossly unfair and this solved the problem. Therefore, de facto, it has come into the M&E works. The M&E industry has not fought against this, because I don't think we have any particular view on it. I don't know if the bills are any better as I haven't yet priced under this system for my company. The stance from the industry was "bill, not bill. It didn't really matter". But at the same time the item which the M&E wanted was to stop the services being tendered four hundred million times. So once the name specialist item was going through in the amendments the bill was totally secondary to the M&E people and I'm not sure if the M&E contractors have really thought about it. We will deal with it one way or another.

Question 3:

Interim Measure 2 allows for the direct tendering of reserve specialists for mechanical and electrical services where specialist works make up a significant proportion of the overall project value or where they have a significant impact on the long-term performance of the project.

W) Do you believe that this will negate the requirement for the measurement of mechanical and electrical packages in such instances?

NB: I think that under the contract the measurement is there and that's it. I don't think it's needed. I don't think the client will get any real benefit. The bill is there because of how unfair the contract was towards the builder. If it's not all billed out and itemed the contractor has a fair way of dealing. The government don't want to deal with subcontractors. I don't believe that it will add any value and that it will add a surveying cost. But that surveying cost could be worth it in relation to what main contractors have been charging.

X) Will this aid in providing cost certainty for the Client at an early stage of the project?

NB: I think it will. I think it will do two things. It will give them a better quality job. It will give them cost certainty. I think initially it may give them higher costs than they have been getting, but the quality will be higher and they will get better jobs which will save them money in the long run. They will get real value if they incorporate life cycle costing.

Question 4:

The guidelines for implementation of the interim measures make reference to an 18 month period for the upskilling of quantity surveyors in the field of mechanical and electrical measurement. In

the interim mechanical and electrical bill of quantities are to be measured using the ARM4 Supplement 2 (abridged rules for the measurement of mechanical and electrical services).

W) Do you feel that this is a sufficient time frame and are there resources available to allow industry to upskill?

NB: I don't know. It should be sufficient time but the increase in work and the skills shortage it may not be sufficient time. I don't know where the PQS will get to the skill level to produce complete bills of quantities. They will be taking the M&E estimators and training them as quantity surveyors rather than training from the surveyors' side. No offence to surveyors, if they're not M&E people it's not going to work. Our best estimators are tradesmen who don't want to be tradesmen. It apprentices who don't want to work with their hands. Now, one thing I do want to say is that 3D BIM is going to help. But the QS who is going to measure is going to flip back to the QS needing the designer to input the information into the model and extrapolating this by the push of one button. Why would the client pay the fee for this? There is no reason that every length of pipe etc. not be inputted correctly. The surveyor should only be concerned about formatting as per a method of measurement. Our view with the models we have received is that we have to redraw the model to get the best use out of it. Another thing is that parents are not looking at the construction industry being a place for their children and as a result these children do not enter the industry. The courses which are available seem to be aimed at people who are interested in upskilling at producing paper work. The builders have gone away from having people on site to manage. I think traditionally where a lot of knowledge comes from both in design and contracting, and from the M&E point of view for measurement, forgetting the legal and technical side of quantity surveying. On the M&E services side it's hard to beat the people who have come through the trades and then want to do other things because their knowledge is very good. And we have skipped that level because so many of the trades that have left. The apprentices generally came through parents who were connected to the companies or businesses. The pool has become much smaller due to the recession. We, as an industry, are targeting the wrong people. How do I get good engineers? They have been taken by the larger companies. We couldn't educate those in house because the part time courses were gone due to the economic recession. So, I don't feel that we have the pool to make this work in 18 months. Traditionally they come in at a lower level and build their experience up while working. But that's gone. That path to a career is gone. They are not going to get the numbers going through based on this.

X) From your experience and knowledge do you believe that the use of the ARM 4 Supplement will be of benefit in the interim period or would it be better to use Sections M & N of the ARM 4.

NB: My knowledge of ARM4, my knowledge of quantity surveying is limited. I need to look at this in more detail. But if we go back to your earlier question about the 18 month period and the way in which M&E people price that there is a good chance that the full ARM will not come in and that there will be some form of standardisation using the ARM 4 Supplement 2. The professionals will be using a one line item to measure the systems. So a system will come into play which will allow for a schedule of rates for the valuation of additional items. Things that are multiple measures will become line items based on the drawings. Then produce a schedule rates. The bill will not be fully re-measurable but will allow for variations of the sum. I think the supplement will still be in use in 5 years but will be adapted by industry.

Question 5

Results from a poll of 55 mechanical and electrical contractors working in the Irish construction industry showed that only 20% had priced bills of quantities at tender stage while the majority (96%) had priced on the basis of drawings and specification.

What do you believe to be the main reasons for such a difference in the between the two results?

NB: Well, we would be predominantly a HVAC company and would not be working in an FGI market so I have probably seen 40 billed jobs over the last 20 years. Our normal tender list would be 250-350 jobs per year. In many cases the bills in these jobs did not form part of the contract and so were pointless. We have had to fill these in and the bill did not form part of the contract. In certain cases the bill was not fully related to the drawings. There are very few bills being issued as there has been no reason based on the status of the bill within the contract. Varmings used to do it but that fell by the wayside. Generally the knowledge was not there within the surveyors and the desire of others to do it.

Question 6:

The guidelines for the implementation of the interim measures requires the mechanical and electrical contractors to fully price the bill of quantities as produced in line with the ARM4 or the Supplement 2.

Do you believe this to be a practical approach in what can be a very complex area of the industry?

NB: Some form of an adjustment on the supplement where a lumps sum exists may be better. It can be laborious filling in a bill of quantities which is not worth the paper it's written on. No offence to quantity surveyors, you are not putting down half inch drain cock including. A bill is either a bill or it's not. Then one day you will be billing and include a full description and the lad beside you will bill the item. So now, not only do we have a set a builders sending information in different ways, we are now going to get a set of quantity surveyors who are billing differently and now I have to change my estimating system. Then you make it work, a week and half into the tender, you start with the addendums and changes to the bill. The estimator has to go back and change his estimating approach. Consistency of the bill is a huge issue and a huge time constraint and that needs to be worked out. So until such time as the teams get consistency on the bills you are going to get major inconsistency on the way bills goes back. A recent tender which came through was priced from the drawings and specifications in one and half weeks including the amendments but the bill took in excess of three weeks. The bill was a proper bill but took a while to work through. We did spend extra time on this one in order to use it as a case study. I see as a result that you will see a number of grouped items until the method of measurement is agreed. I believe that there will be problems until the one form of pricing arrives from all the individual offices and I can guarantee that that will never happen. So do you make somebody fill in every line item?? I don't think it's practical in every line item. I don't think it's practical in the control item unless you include the controls. I have seen the three port valve as a billed item when it's part of the controls which we have received a lump sum price for from our supplier. We don't get those breakdowns from these suppliers and if we do it may be 20 minutes before the tender is due in. So you either change the measurement rule to suit same or you accept brackets in the pricing document. If you put the sprinklers into the mechanical package you may not get the breakdown unless you tendered it directly. You don't get the breakdown the ways the bills are written. If you're under pressure then you start to make it up. You may not be able to back this up at a later stage or the re-measure may omit this aspect and you may lose out.

Appendix C: Ethical Approval

Student Name:	Charles Mitchell	Student ID:	@00330617
Supervisor:	David Baldry	Ethics Reviewer:	Marcus Ormerod
Project Title:	An evaluation of the ability of the Quantity Surveyor to measure Mechanical and Electrical services under the Irish Public Works Contracts (designed by the employer) using the Agreed Rules of Measurement.		
Feedback on Ethical Approval Application			
Based on the documentation submitted ethical approval is granted.			
Description			Decision
Type 2 – Approved This is a Type 2 project. Provided that you address feedback set out above (if any) to your Supervisor’s satisfaction, and that you carry out your data collection substantially in accordance with the procedure you have described, and using the explanatory and confirmatory documentation supplied, then you have ethical approval for your research.			APPROVED

IMPORTANT REMINDER - EXTENSIONS

CHECK THAT YOU KNOW WHEN YOUR RESEARCH PHASE ENDS. IF YOU REQUIRE AN EXTENSION (AND ARE STILL ENTITLED TO ONE) ENSURE THAT YOU REQUEST IT BEFORE YOUR RESEARCH PHASE ENDS. DETAILS OF HOW TO REQUEST AN EXTENSION ARE IN THE HANDBOOK.

IF YOU HAVE QUERIES, CONTACT sobe-programme-support@salford.ac.uk